



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

Request For Bids For Construction Services

Two-Stage Bidding Process

Stage II – Mechanical Contractors Bidders List
Invitation to Bid

October 21, 2005

HVAC AND CONTROLS UPGRADE PROVO FOURTH DISTRICT COURT

**ADMINISTRATIVE OFFICE OF THE
COURTS
PROVO, UTAH**

DFCM Project No. 04200150

WHW Engineering

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Current copies of the following documents are hereby made part of these contract documents by reference. These documents are available on the DFCM web site at <http://dfcm.utah.gov> or are available upon request from DFCM:

DFCM General Conditions dated May 25, 2005

DFCM Application and Certificate for Payment dated May 25, 2005

Technical Specifications:

Drawings:

The Agreement and General Conditions dated May 25, 2005 have been updated from versions that were formally adopted and in use prior to this date. The changes made to the General Conditions are identified in a document entitled Revisions to General Conditions that is available on DFCM's web site at <http://dfcm.utah.gov>

INVITATION TO BID

**ONLY CONTRACTORS PREVIOUSLY SHORT-LISTED DURING STAGE I
ARE ALLOWED TO BID ON THIS PROJECT**

The State of Utah - Division of Facilities Construction and Management (DFCM) is requesting bids for the construction of the following project:

HVAC AND CONTROLS UPGRADE – PROVO FOURTH DISTRICT COURT
ADMINISTRATIVE OFFICE OF THE COURTS – PROVO, UTAH
DFCM PROJECT NO: 04200150

The major portion of the work is the installation of a new automatic temperature control system replacing the existing control system. Additional work includes the addition of new VAV boxes and some ductwork modifications. Construction cost estimate: \$175,774

<u>FIRM NAME</u>	<u>POINT OF CONTACT</u>	<u>PHONE</u>	<u>FAX</u>
A.H. Palmer	Mr. Val Palmer	(435) 752-4814	(435) 752-6991
Alternative Mechanical Cont	Mr. Ron White	(801) 261-8523	(801) 261-8561
Barclay Mechanical	Mr. Mike Barclay	(435) 835-5084	(435) 835-5085
KOH Mechanical Contractors	Mr. Larry Hansen	(801) 254-7013	(801) 254-6374
Mechanical Service and Systems	Mr. Randy Karren	(801) 255-9333	(801) 561-4673
Palmer-Christiansen Company Inc	Mr. Brett Christiansen	(801) 466-1679	(801) 466-1777
Ralph Tye and Sons, Inc	Mr. Doug Tye	(801) 262-9900	(801) 262-1391
S.R. Mechanical, Inc.	Mr. Steven Roberts	(435) 529-7492	(435) 529-7851
U.S. Mechanical, LLC	Mr. Brad Bylund	(801) 785-6028	(801) 785-6029

The bid documents will be available on Friday, October 21, 2005 in electronic format from DFCM at 4110 State Office Building, Salt Lake City, Utah 84114, telephone (801)538-3018 and on the DFCM web page at <http://dfcm.utah.gov>. For questions regarding this project, please contact Craig Wessman, Project Manager, DFCM, at (801) 538-3246. No others are to be contacted regarding this project.

A **MANDATORY** pre-bid meeting and site visit will be held at 9:30 AM on Friday October 28, 2005 at the Provo Fourth District Court, 125 North 100 West, Provo, Utah 84601. Meet in the main entrance lobby after going through the security screening area. All short listed prime contractors wishing to bid on this project must attend this meeting.

Bids must be submitted by 3:00 PM on Wednesday, November 9, 2005 to DFCM, 4110 State Office Building, Salt Lake City, Utah 84114. Bids will be opened and read aloud in the DFCM Conference Room, 4110 State Office Building, Salt Lake City, Utah. Note: Bids must be received at 4110 State Office Building by the specified time. The contractor shall comply with and require all of its subcontractors to comply with the license laws as required by the State of Utah.

A bid bond in the amount of five percent (5%) of the bid amount, made payable to the Division of Facilities Construction and Management on DFCM's bid bond form, shall accompany the bid.

The Division of Facilities Construction & Management reserves the right to reject any or all bids or to waive any formality or technicality in any bid in the interest of the State.

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT
MARLA WORKMAN, CONTRACT COORDINATOR
4110 State Office Bldg., Salt Lake City, Utah 84114

STAGE II BIDDING PROCESS

ONLY CONTRACTORS PREVIOUSLY SHORT-LISTED DURING STAGE I ARE ALLOWED TO BID ON THIS PROJECT

1. Invitational Bid Procedures

Invitation to Bid: DFCM will notify each short-listed firm via e-mail and/or fax when a project is ready for construction services.

Bid Documents: Bidding documents including plans and specifications (if applicable) may be obtained by accessing DFCM's web page at <http://dfcm.utah.gov> or at DFCM's office 4110 State Office Building, Salt Lake City, Utah 84114 which will be a CD.

Mandatory Pre-Bid Site Meeting: If required, the schedule contained in this document will indicate the date, time, and place of the mandatory pre-bid site meeting. At this meeting, contractors will receive additional instructions about the project and have an opportunity to ask questions about project details. If a firm fails to attend a pre-bid site meeting labeled "Mandatory" they will not be allowed to bid on the project.

Written Questions: The schedule contained in this document will indicate the deadline for submitting questions in writing to the DFCM Representative pertaining to this project.

Final Addendum: The schedule contained in this document will indicate the deadline for DFCM issuing the final addendum clarifying questions and changes to the scope of work. Contractors are responsible for obtaining and responding to information contained in the addenda.

Submitting Bids: Bids must be submitted to DFCM, 4110 State Office Building, Salt Lake City, Utah 84114 by the deadline indicated on the schedule contained in this document. Bids submitted after the deadline will not be accepted. Bids will be opened at DFCM on the date, time, and place indicated on the schedule. (Additional information pertaining to bidding is contained later in this document). It is your responsibility to allow for the time needed to park on Capitol Hill as recent construction activity has made the parking more difficult. Identification is required to enter the building.

Subcontractors List: The firm selected for the project must submit a list of all subcontractors by the deadline indicated on the schedule contained in this document. (Additional information pertaining to subcontractor lists is contained later in this document)

2. Drawings and Specifications, Other Contract Documents

Drawings and Specifications, as well as other available Contract Documents, may be obtained as stated in the Notice to Contractors.

3. **Bids**

Before submitting a bid, each bidder shall carefully examine the Contract Documents; shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the bid the cost of all items required by the Contract Documents. If the bidder observes that portions of the Contract Documents are at variance with applicable laws, building codes, rules, regulations or contain obvious erroneous or uncoordinated information, the bidder shall promptly notify the DFCM Representative and the necessary changes shall be accomplished by Addendum.

The bid, bearing original signatures, must be typed or handwritten in ink on the Bid Form provided in the procurement documents and submitted in a sealed envelope at the location specified by the Notice to Contractor's prior to the published deadline for the submission of bids.

Bid bond security, in the amount of five percent (5%) of the bid, made payable to the Division of Facilities Construction and Management, shall accompany bid. **THE BID BOND MUST BE ON THE BID BOND FORM PROVIDED IN THE PROCUREMENT DOCUMENTS IN ORDER TO BE CONSIDERED AN ACCEPTABLE BID.**

If the bid bond security is submitted on a bid bond form other than the DFCM's required bid bond form, and the bid security meets all other legal requirements, the bidder will be allowed to provide an acceptable bid bond by the close of business on the next business day following notification by DFCM of submission of a defective bid bond security. **Note: A cashier's check cannot be used as a substitute for a bid bond.**

4. **Contract and Bond**

The Contractor's Agreement will be in the form bound in the specifications. The Contract Time will be as indicated in the bid. The successful bidder, simultaneously with the execution of the Contract Agreement, will be required to furnish a performance bond and a payment bond, both bearing original signatures, upon the forms provided in the procurement documents. The performance and payment bonds shall be for an amount equal to one hundred percent (100%) of the Contract Sum and secured from a company that meets the requirements specified in the requisite forms. Any bonding requirements for Subcontractors will be specified in the Supplementary General Conditions.

5. **Listing of Subcontractors**

Listing of Subcontractors shall be as summarized in the “Instructions and Subcontractor’s List Form”, which are included as part of these Contract Documents. The subcontractors list shall be delivered to DFCM or faxed to DFCM at (801)538-3677 within 24 hours of the bid opening. Requirements for listing additional subcontractors will be listed in the Contract Documents.

DFCM retains the right to audit or take other steps necessary to confirm compliance with requirements for the listing and changing of subcontractors. Any contractor who is found to not be in compliance with these requirements is subject to a debarment hearing and may be debarred from consideration for award of contract for a period of up to three years.

6. **Interpretation of Drawings and Specifications**

If any person or entity contemplating submitting a bid is in doubt as to the meaning of any part of the drawings, specifications or other Contract Documents, such person shall submit to the DFCM Representative a request for an interpretation thereof. The person or entity submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by Addenda duly issued and a copy of such Addenda will be mailed or delivered to each person or entity receiving a set of documents. Neither DFCM nor A/E will be responsible for any other explanations or interpretations of the proposed documents. A/E shall be deemed to refer to the architect or engineer hired by DFCM as the A/E or Consultant for the Project.

7. **Addenda**

Any Addenda issued during the time of bidding shall become part of the Contract Documents made available to the bidders for the preparation of the bid, shall be covered in the bid, and shall be made a part of the Contract.

8. **Award of Contract**

The Contract will be awarded as soon as possible to the lowest, responsive and responsible bidder, based on the lowest combination of base bid and acceptable prioritized alternates, provided the bid is reasonable, is in the interests of the State of Utah to accept and after applying the Utah Preference Laws in U.C.A. Title 63, Chapter 56. The DFCM reserves the right to waive any technicalities or formalities in any bid or in the bidding. Alternates will be accepted on a prioritized basis with Alternate 1 being highest priority, Alternate 2 having second priority, etc.

9. **DFCM Contractor Performance Rating**

DFCM will evaluate the performance of the Contractor. This evaluation may include comments from the User. The Contractor will have an opportunity to review and comment on the evaluation. Evaluations, including the Contractor's comments, may be considered in future selection in the evaluation of the Contractor's past performance.

10. **Licensure**

The Contractor shall comply with and require all of its Subcontractors to comply with the license laws as required by the State of Utah.

11. **Right to Reject Bids**

DFCM reserves the right to reject any or all Bids.

12. **Time is of the Essence**

The completion deadline for this project is **Friday, February 10, 2006**. Failure to meet the completion deadline may result in a poor performance rating from DFCM which may have a negative impact on your firm's ability to obtain future work with the state of Utah and may also result in liquidated damages being assessed. Time is of the essence in regard to all the requirements of the Contract Documents.

13. **Withdrawal of Bids**

Bids may be withdrawn on written request received from bidders within 24 hours after the bid opening if the contractor has made an error in preparing the bid.

14. **Product Approvals**

Where reference is made to one or more proprietary products in the Contract Documents, but restrictive descriptive materials of one or more manufacturer(s) is referred to in the Contract Documents, the products of other manufacturers will be accepted, provided they equal or exceed

the standards set forth in the drawings and specifications and are compatible with the intent and purpose of the design, subject to the written approval of the A/E. Such written approval must occur prior to the deadline established for the last scheduled addenda to be issued. The A/E's written approval will be in an issued Addendum. If the descriptive material is not restrictive, the products of other manufacturers specified will be accepted without prior approval provided they are compatible with the intent and purpose of the design as determined by the A/E.

15. **Financial Responsibility of Contractors, Subcontractors and Sub-subcontractors**

Contractors shall respond promptly to any inquiry in writing by the DFCM to any concern of financial responsibility of the Contractor, Subcontractor or Sub-subcontractor.

16. **Debarment.**

By submitting a bid, the Contractor certifies that neither it nor its principals, including project and site managers, have been, or are under consideration for, debarment or suspension, or any action that would exclude such from participation in a construction contract by any governmental department or agency. If the Contractor cannot certify this statement, attach to the bid a detailed written explanation which must be reviewed and approved by the DFCM as part of the requirements for award of the Project.

**Division of Facilities Construction and Management**

PROJECT SCHEDULE

Stage II = Two-Stage Bidding Process

PROJECT NAME: HVAC AND CONTROLS UPGRADE – PROVO FOURTH DISTRICT COURT ADMINISTRATIVE OFFICE OF THE COURTS – PROVO, UTAH				
DFCM PROJECT # 04200150				
Event	Day	Date	Time	Place
Stage II Bidding Documents Available	Friday	October 21, 2005	9:00 AM	DFCM, 4110 State Office Bldg, SLC, UT and DFCM web site *
Mandatory Pre-bid Site Meeting	Friday	October 28, 2005	9:30 AM	Provo Fourth District Court 125 North 100 West Provo, UT **
Last Day to Submit Questions	Friday	November 4, 2005	4:00 PM	DFCM, 4110 State Office Bldg, SLC, UT
Final Addendum Issued	Monday	November 7, 2005	4:00 PM	DFCM, 4110 State Office Bldg, SLC, UT or DFCM web site*
Prime Contractors Turn in Bid and Bid Bond / Bid Opening in DFCM Conference Room	Wednesday	November 9, 2005	3:00 PM	DFCM, 4110 State Office Bldg, SLC, UT
Subcontractors List Due	Thursday	November 10, 2005	3:00 PM	DFCM, 4110 State Office Bldg, SLC, UT
Project Completion Date	Friday	February 10, 2006		

* DFCM's web site address is <http://dfcm.utah.gov>

** Meet at the main entrance lobby of the courthouse after going through the security screening area.



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

BID FORM

NAME OF BIDDER _____ DATE _____

To the Division of Facilities Construction and Management
4110 State Office Building
Salt Lake City, Utah 84114

The undersigned, responsive to the "Notice to Contractors" and in accordance with the Request for Bids for the **HVAC AND CONTROLS UPGRADE – PROVO FOURTH DISTRICT COURT – ADMINISTRATIVE OFFICE OF THE COURTS - DFCM PROJECT #04200150**, and having examined the Contract Documents and the site of the proposed Work and being familiar with all of the conditions surrounding the construction of the proposed Project, including the availability of labor, hereby proposes to furnish all labor, materials and supplies as required for the Work in accordance with the Contract Documents as specified and within the time set forth and at the price stated below. This price is to cover all expenses incurred in performing the Work required under the Contract Documents of which this bid is a part:

I/We acknowledge receipt of the following Addenda: _____

For all work shown on the Drawings and described in the Specifications and Contract Documents, I/we agree to perform for the sum of:

_____ DOLLARS (\$_____) (In case of discrepancy, written amount shall govern)

I/We guarantee that the Work will be Substantially Complete by **February 10, 2006**, should I/we be the successful bidder, and agree to pay liquidated damages in the amount of **\$150.00** per day for each day after expiration of the Contract Time as stated in Article 3 of the Contractor's Agreement.

This bid shall be good for 45 days after bid opening.

Enclosed is a 5% bid bond, as required, in the sum of _____

The undersigned Contractor's License Number for Utah is _____.

BID FORM
PAGE NO. 2

Upon receipt of notice of award of this bid, the undersigned agrees to execute the contract within ten (10) days, unless a shorter time is specified in Contract Documents, and deliver acceptable Performance and Payment bonds in the prescribed form in the amount of 100% of the Contract Sum for faithful performance of the contract. The Bid Bond attached, in the amount not less than five percent (5%) of the above bid sum, shall become the property of the Division of Facilities Construction and Management as liquidated damages for delay and additional expense caused thereby in the event that the contract is not executed and/or acceptable 100% Performance and Payment bonds are not delivered within time set forth.

Type of Organization:

(Corporation, Partnership, Individual, etc.)

Any request and information related to Utah Preference Laws:

Respectfully submitted,

Name of Bidder

ADDRESS:

Authorized Signature

BID BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed, (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the STATE OF UTAH, hereinafter referred to as the "Obligee," in the amount of \$ _____ (5% of the accompanying bid), being the sum of this Bond to which payment the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted to Obligee the accompanying bid incorporated by reference herein, dated as shown, to enter into a contract in writing for the _____ Project.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that if the said principal does not execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the principal, then the sum of the amount stated above will be forfeited to the State of Utah as liquidated damages and not as a penalty; if the said principal shall execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the Principal, then this obligation shall be null and void. It is expressly understood and agreed that the liability of the Surety for any and all defaults of the Principal hereunder shall be the full penal sum of this Bond. The Surety, for value received, hereby stipulates and agrees that obligations of the Surety under this Bond shall be for a term of sixty (60) days from actual date of the bid opening.

PROVIDED, HOWEVER, that this Bond is executed pursuant to provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals on the date indicated below, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

DATED this _____ day of _____, 20_____.

Principal's name and address (if other than a corporation):

By: _____

Title: _____

Principal's name and address (if a corporation):

By: _____

Title: _____
(Affix Corporate Seal)

Surety's name and address:

STATE OF _____)
COUNTY OF _____) ss.

By: _____
Attorney-in-Fact (Affix Corporate Seal)

On this ____ day of _____, 20_____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.

My Commission Expires: _____

Resides at: _____

Agency: _____
Agent: _____
Address: _____
Phone: _____

NOTARY PUBLIC

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

**Division of Facilities Construction and Management****INSTRUCTION AND SUBCONTRACTORS LIST FORM**

The three low bidders, as well as all other bidders that desire to be considered, are required by law to submit to DFCM within 24 hours of bid opening a list of **ALL** first-tier subcontractors, including the subcontractor's name, bid amount and other information required by Building Board Rule and as stated in these Contract Documents, on the following basis:

PROJECTS UNDER \$500,000 - ALL SUBS \$20,000 OR OVER MUST BE LISTED
PROJECTS \$500,000 OR MORE - ALL SUBS \$35,000 OR OVER MUST BE LISTED

- Any additional subcontractors identified in the bid documents shall also be listed.
- The DFCM Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law.
- List subcontractors for base bid as well as the impact on the list that the selection of any alternate may have.
- Bidder may not list more than one subcontractor to perform the same work.
- Bidder must list "Self" if performing work itself.

LICENSURE:

The subcontractor's name, the type of work, the subcontractor's bid amount, and the subcontractor's license number as issued by DOPL, if such license is required under Utah Law, shall be listed. Bidder shall certify that all subcontractors, required to be licensed, are licensed as required by State law. A subcontractor includes a trade contractor or specialty contractor and does not include suppliers who provide only materials, equipment, or supplies to a contractor or subcontractor.

BIDDER LISTING 'SELF' AS PERFORMING THE WORK:

Any bidder that is properly licensed for the particular work and intends to perform that work itself in lieu of a subcontractor that would otherwise be required to be on the subcontractor list, must insert the term 'Self' for that category on the subcontractor list form. Any listing of 'Self' on the sublist form shall also include the amount allocated for that work.

'SPECIAL EXCEPTION':

A bidder may list 'Special Exception' in place of a subcontractor when the bidder intends to obtain a subcontractor to perform the work at a later date because the bidder was unable to obtain a qualified or reasonable bid under the provisions of U.C.A. Section 63A-5-208(4). The bidder shall insert the term 'Special Exception' for that category of work, and shall provide documentation with the subcontractor list describing the bidder's efforts to obtain a bid of a qualified subcontractor at a reasonable cost and why the bidder was unable to obtain a qualified subcontractor bid. The Director must find that the bidder complied in good faith with State law requirements for any 'Special Exception' designation, in order for the bid to be considered. If awarded the contract, the Director shall supervise the bidder's efforts to obtain a qualified subcontractor bid. The amount of the awarded contract may not be adjusted to reflect the actual amount of the subcontractor's bid. Any listing of 'Special Exception' on the sublist form shall also include amount allocated for that work.

INSTRUCTIONS AND SUBCONTRACTORS LIST FORM
Page No. 2

GROUND FOR DISQUALIFICATION:

The Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law. Director may withhold awarding the contract to a particular bidder if one or more of the proposed subcontractors are considered by the Director to be unqualified to do the Work or for such other reason in the best interest of the State of Utah. Notwithstanding any other provision in these instructions, if there is a good faith error on the sublist form, at the sole discretion of the Director, the Director may provide notice to the contractor and the contractor shall have 24 hours to submit the correction to the Director. If such correction is submitted timely, then the sublist requirements shall be considered met.

CHANGES OF SUBCONTRACTORS SPECIFICALLY IDENTIFIED ON SUBLIST FORM:

Subsequent to twenty-four hours after the bid opening, the contractor may change its listed subcontractors only after receiving written permission from the Director based on complying with all of the following criteria.

- (1) The contractor has established in writing that the change is in the best interest of the State and that the contractor establishes an appropriate reason for the change, which may include, but not is not limited to, the following reasons: the original subcontractor has failed to perform, or is not qualified or capable of performing, and/or the subcontractor has requested in writing to be released.
- (2) The circumstances related to the request for the change do not indicate any bad faith in the original listing of the subcontractors.
- (3) Any requirement set forth by the Director to ensure that the process used to select a new subcontractor does not give rise to bid shopping.
- (4) Any increase in the cost of the subject subcontractor work is borne by the contractor.
- (5) Any decrease in the cost of the subject subcontractor work shall result in a deductive change order being issued for the contract for such decreased amount.
- (6) The Director will give substantial weight to whether the subcontractor has consented in writing to being removed unless the Contractor establishes that the subcontractor is not qualified for the work.

EXAMPLE:

Example of a list where there are only four subcontractors:

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #
ELECTRICAL	ABCD Electric Inc.	\$350,000.00	123456789000
LANDSCAPING	"Self"	300,000.00	123456789000
CONCRETE (ALTERNATE #1)	XYZ Concrete Inc	298,000.00	987654321000
MECHANICAL	"Special Exception" (attach documentation)	Fixed at: 350,000.00	(TO BE PROVIDED AFTER OBTAINING SUBCONTRACTOR)

**PURSUANT TO STATE LAW - SUBCONTRACTOR BID AMOUNTS CONTAINED IN THIS
SUBCONTRACTOR LIST SHALL NOT BE DISCLOSED UNTIL THE CONTRACT HAS BEEN AWARDED.**

**Division of Facilities Construction and Management****SUBCONTRACTORS LIST****PROJECT TITLE:** _____**Caution:** You must read and comply fully with instructions.

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #

We certify that:

1. This list includes all subcontractors as required by the instructions, including those related to the base bid as well as any alternates.
2. We have listed "Self" or "Special Exception" in accordance with the instructions.
3. All subcontractors are appropriately licensed as required by State law.

FIRM: _____

DATE: _____

SIGNED BY: _____

NOTICE: FAILURE TO SUBMIT THIS FORM, PROPERLY COMPLETED AND SIGNED, AS REQUIRED IN THESE CONTRACT DOCUMENTS, SHALL BE GROUNDS FOR DFCMS REFUSAL TO ENTER INTO A WRITTEN CONTRACT WITH BIDDER. ACTION MAY BE TAKEN AGAINST BIDDERS BID BOND AS DEEMED APPROPRIATE BY DFCM. ATTACH A SECOND PAGE IF NECESSARY.

FUGITIVE DUST PLAN

The Contractor will fill out the form and file the original with the Division of Air Quality and a copy of the form with the Division of Facilities Construction & Management, prior to the issuance of any notice to proceed.

The Contractor will be fully responsible for compliance with the Fugitive Dust Control Plan, including the adequacy of the plan, any damages, fines, liability, and penalty or other action that results from noncompliance.

Utah Division of Air Quality

April 20, 1999

**GUIDANCE THAT MUST BE CONSIDERED IN DEVELOPING AND SUBMITTING A
DUST CONTROL PLAN FOR COMPLIANCE WITH R307-309-3, 4, 5, 6, 7**

Source Information:

1. Name of your operation (source): provide a name if the source is a construction site.
2. Address or location of your operation or construction site.
3. UTM coordinates or Longitude/Latitude of stationary emission points at your operation.
4. Lengths of the project, if temporary (time period).
5. Description of process (include all sources of dust and fugitive dust). Please, if necessary, use additional sheets of paper for this description. Be sure to mark it as an attachment.
6. Type of material processed or disturbed.
7. Amount of material processed (tons per year, tons per month, lbs./hr., and applicable units).

8. Destination of product (where will the material produced be used or transported, be specific, provide address or specific location), information needed for temporary relocation applicants.
9. Identify the individual who is responsible for the implementation and maintenance of fugitive dust control measures. List name(s), position(s) and telephone number(s).
10. List, and attach copies of any contract lease, liability agreement with other companies that may, or will, be responsible for dust control on site or on the project.

Description of Fugitive Dust Emission Activities
(Things to consider in addressing fugitive dust control strategies.)

1. Type of activities (drilling and blasting, road construction, development construction, earth moving and excavation, handling and hauling materials, cleaning and leveling, etc).
2. List type of equipment generating the fugitive dust.
3. Diagram the location of each activity or piece of equipment on site. Please attach the diagram.
4. Provide pictures or drawings of each activity. Include a drawing of the unpaved/paved road network used to move loads “on” and “off” property.
5. Vehicle miles travels on unpaved roads associated with the activity (average speed).
6. Type of dust emitted at each source (coal, cement, sand, soil, clay, dust, etc.)
7. Estimate the size of the release area at which the activity occurs (square miles). For haul or dirt roads include total miles of road in use during the activity.

Description of Fugitive Dust Emission Controls on Site

Control strategies must be designed to meet 20% opacity or less on site (a lesser opacity may be defined by Approval Order conditions or federal requirements such as NSPS), and control strategies must prevent exceeding 10% opacity from fugitive dust at the property boundary (site boundary) for compliance with R307-309-3.

1. Types of ongoing emission controls proposed for each activity, each piece of equipment, and haul roads.
2. Types of additional dust controls proposed for bare, exposed surfaces (chemical stabilization, synthetic cover, wind breaks, vegetative cover, etc).
3. Method of application of dust suppressant.
4. Frequency of application of dust suppressant.
5. Explain what triggers the use of a special control measure other than routine measures already in place, such as covered loads or measures covered by a permit condition (increase in opacity, high winds, citizen complaints, dry conditions, etc).
6. Explain in detail what control strategies/measures will be implemented off-hours, i.e., Saturdays/Sundays/Holidays, as well as 6 PM to 6 AM each day.

Description of Fugitive Dust Control Off-site

Prevent, to the maximum extent possible, deposition of materials, which may create fugitive dust on public and private paved roads in compliance with R307-309-5, 6, 7.

1. Types of emission controls initiated by your operation that are in place “off” property (application of water, covered loads, sweeping roads, vehicle cleaning, etc.).

2. Proposed remedial controls that will be initiated promptly if materials, which may create fugitive dust, are deposited on public and private paved roads.

Submit the Dust Control Plan to:

Executive Secretary
Utah Air Quality Board
POB 144820
15 North 1950 West
Salt Lake City, Utah 84114-4820

Phone: (801) 536-4000
FAX: (801) 536-4099

Fugitive Dust Control Plan Violation Report

When a source is found in violation of R307-309-3 or in violation of the Fugitive Dust Control Plan, the source must submit a report to the Executive Secretary within 15 days after receiving a Notice of Violation. The report must include the following information:

1. Name and address of dust source.
2. Time and duration of dust episode.
3. Meteorological conditions during the dust episode.
4. Total number and type of fugitive dust activities and dust producing equipment within each operation boundary. If no change has occurred from the existing dust control plan, the source should state that the activity/equipment is the same.
5. Fugitive dust activities or dust producing equipment that caused a violation of R-307-309-3 or the source's dust control plan.
6. Reasons for failing to control dust from the dust generating activity or equipment.
7. New and/or additional fugitive dust control strategies necessary to achieve compliance with R307-309-3, 4, 5, 6, or 7.
8. If it can not be demonstrated that the current approved Dust Control Plan can result in compliance with R307-309-3 through 7, the Dust Control Plan must be revised so as to demonstrate compliance with 307-309-3 through 7. Within 30 days of receiving a fugitive dust Notice of Violation, the source must submit the revised Plan to the Executive Secretary for review and approval.

Submit the Dust Control Plan to:

Executive Secretary	Phone: (801) 536-4000
Utah Air Quality Board	FAX: (801) 536-4099
POB 144820	
15 North 1950 West	
Salt Lake City, Utah 84114-4820	

Attachments: DFCM Form FDR R-307-309, Rule 307-309

CONTRACTOR'S AGREEMENT

FOR:

THIS CONTRACTOR'S AGREEMENT, made and entered into this ____ day of _____, 20__, by and between the DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT, hereinafter referred to as "DFCM", and _____, incorporated in the State of _____ and authorized to do business in the State of Utah, hereinafter referred to as "Contractor", whose address is _____.

WITNESSETH: WHEREAS, DFCM intends to have Work performed at _____
_____.

WHEREAS, Contractor agrees to perform the Work for the sum stated herein.

NOW, THEREFORE, DFCM and Contractor for the consideration provided in this Contractor's Agreement, agree as follows:

ARTICLE 1. SCOPE OF WORK. The Work to be performed shall be in accordance with the Contract Documents prepared by _____ and entitled "_____
_____."

The DFCM General Conditions ("General Conditions") dated May 25, 2005 on file at the office of DFCM and available on the DFCM website, are hereby incorporated by reference as part of this Agreement and are included in the specifications for this Project. All terms used in this Contractor's Agreement shall be as defined in the Contract Documents, and in particular, the General Conditions.

The Contractor Agrees to furnish labor, materials and equipment to complete the Work as required in the Contract Documents which are hereby incorporated by reference. It is understood and agreed by the parties hereto that all Work shall be performed as required in the Contract Documents and shall be subject to inspection and approval of DFCM or its authorized representative. The relationship of the Contractor to the DFCM hereunder is that of an independent Contractor.

ARTICLE 2. CONTRACT SUM. The DFCM agrees to pay and the Contractor agrees to accept in full performance of this Contractor's Agreement, the sum of _____ DOLLARS AND NO CENTS (\$_____.00), which is the base bid, and which sum also includes the cost of a 100%

CONTRACTOR'S AGREEMENT
PAGE NO. 2

Performance Bond and a 100% Payment Bond as well as all insurance requirements of the Contractor. Said bonds have already been posted by the Contractor pursuant to State law. The required proof of insurance certificates have been delivered to DFCM in accordance with the General Conditions before the execution of this Contractor's Agreement.

ARTICLE 3. TIME OF COMPLETION AND DELAY REMEDY. The Work shall be Substantially Complete within _____ (____) calendar days after the date of the Notice to Proceed. Contractor agrees to pay liquidated damages in the amount of \$_____ per day for each day after expiration of the Contract Time until the Contractor achieves Substantial Completion in accordance with the Contract Documents, if Contractor's delay makes the damages applicable. The provision for liquidated damages is: (a) to compensate the DFCM for delay only; (b) is provided for herein because actual damages can not be readily ascertained at the time of execution of this Contractor's Agreement; (c) is not a penalty; and (d) shall not prevent the DFCM from maintaining Claims for other non-delay damages, such as costs to complete or remedy defective Work.

No action shall be maintained by the Contractor, including its or Subcontractor or suppliers at any tier, against the DFCM or State of Utah for damages or other claims due to losses attributable to hindrances or delays from any cause whatsoever, including acts and omissions of the DFCM or its officers, employees or agents, except as expressly provided in the General Conditions. The Contractor may receive a written extension of time, signed by the DFCM, in which to complete the Work under this Contractor's Agreement in accordance with the General Conditions.

ARTICLE 4. CONTRACT DOCUMENTS. The Contract Documents consist of this Contractor's Agreement, the Conditions of the Contract (DFCM General Conditions, Supplementary and other Conditions), the Drawings, Specifications, Addenda and Modifications. The Contract Documents shall also include the bidding documents, including the Notice to Contractors, Instructions to Bidders/Proposers and the Bid/Proposal, to the extent not in conflict therewith and other documents and oral presentations that are documented as an attachment to the contract.

All such documents are hereby incorporated by reference herein. Any reference in this Contractor's Agreement to certain provisions of the Contract Documents shall in no way be construed as to lessen the importance or applicability of any other provisions of the Contract Documents.

ARTICLE 5. PAYMENT. The DFCM agrees to pay the Contractor from time to time as the Work progresses, but not more than once each month after the date of Notice to Proceed, and only upon Certificate of the A/E for Work performed during the preceding calendar month, ninety-five percent (95%) of the value of the labor performed and ninety-five percent (95%) of the value of materials furnished in place or on the site. The Contractor agrees to furnish to the DFCM invoices for materials purchased and on the site but not installed, for which the

CONTRACTOR'S AGREEMENT
PAGE NO. 3

Contractor requests payment and agrees to safeguard and protect such equipment or materials and is responsible for safekeeping thereof and if such be stolen, lost or destroyed, to replace same.

Such evidence of labor performed and materials furnished as the DFCM may reasonably require shall be supplied by the Contractor at the time of request for Certificate of Payment on account. Materials for which payment has been made cannot be removed from the job site without DFCM's written approval. Five percent (5%) of the earned amount shall be retained from each monthly payment. The retainage, including any additional retainage imposed and the release of any retainage, shall be in accordance with UCA 13-8-5 as amended. Contractor shall also comply with the requirements of UCA 13-8-5, including restrictions of retainage regarding subcontractors and the distribution of interest earned on the retention proceeds. The DFCM shall not be responsible for enforcing the Contractor's obligations under State law in fulfilling the retention law requirements with subcontractors at any tier.

ARTICLE 6. INDEBTEDNESS. Before final payment is made, the Contractor must submit evidence satisfactory to the DFCM that all payrolls, materials bills, subcontracts at any tier and outstanding indebtedness in connection with the Work have been properly paid. Final Payment will be made after receipt of said evidence, final acceptance of the Work by the DFCM as well as compliance with the applicable provisions of the General Conditions.

Contractor shall respond immediately to any inquiry in writing by DFCM as to any concern of financial responsibility and DFCM reserves the right to request any waivers, releases or bonds from Contractor in regard to any rights of Subcontractors (including suppliers) at any tier or any third parties prior to any payment by DFCM to Contractor.

ARTICLE 7. ADDITIONAL WORK. It is understood and agreed by the parties hereto that no money will be paid to the Contractor for additional labor or materials furnished unless a new contract in writing or a Modification hereof in accordance with the General Conditions and the Contract Documents for such additional labor or materials has been executed. The DFCM specifically reserves the right to modify or amend this Contractor's Agreement and the total sum due hereunder either by enlarging or restricting the scope of the Work.

ARTICLE 8. INSPECTIONS. The Work shall be inspected for acceptance in accordance with the General Conditions.

ARTICLE 9. DISPUTES. Any dispute, PRE or Claim between the parties shall be subject to the provisions of Article 7 of the General Conditions. DFCM reserves all rights to pursue its rights and remedies as provided in the General Conditions.

ARTICLE 10. TERMINATION, SUSPENSION OR ABANDONMENT. This Contractor's Agreement may be terminated, suspended or abandoned in accordance with the General Conditions.

ARTICLE 11. DFCM'S RIGHT TO WITHHOLD CERTAIN AMOUNT AND MAKE USE THEREOF. The DFCM may withhold from payment to the Contractor such amount as, in DFCM's judgment, may be necessary to pay just claims against the Contractor or Subcontractor at any tier for labor and services rendered and materials furnished in and about the Work. The DFCM may apply such withheld amounts for the payment of such claims in DFCM's discretion. In so doing, the DFCM shall be deemed the agent of Contractor and payment so made by the DFCM shall be considered as payment made under this Contractor's Agreement by the DFCM to the Contractor. DFCM shall not be liable to the Contractor for any such payment made in good faith. Such withholdings and payments may be made without prior approval of the Contractor and may be also be prior to any determination as a result of any dispute, PRE, Claim or litigation.

ARTICLE 12. INDEMNIFICATION. The Contractor shall comply with the indemnification provisions of the General Conditions.

ARTICLE 13. SUCCESSORS AND ASSIGNMENT OF CONTRACT. The DFCM and Contractor, respectively bind themselves, their partners, successors, assigns and legal representatives to the other party to this Agreement, and to partners, successors, assigns and legal representatives of such other party with respect to all covenants, provisions, rights and responsibilities of this Contractor's Agreement. The Contractor shall not assign this Contractor's Agreement without the prior written consent of the DFCM, nor shall the Contractor assign any moneys due or to become due as well as any rights under this Contractor's Agreement, without prior written consent of the DFCM.

ARTICLE 14. RELATIONSHIP OF THE PARTIES. The Contractor accepts the relationship of trust and confidence established by this Contractor's Agreement and covenants with the DFCM to cooperate with the DFCM and A/E and use the Contractor's best skill, efforts and judgment in furthering the interest of the DFCM; to furnish efficient business administration and supervision; to make best efforts to furnish at all times an adequate supply of workers and materials; and to perform the Work in the best and most expeditious and economic manner consistent with the interests of the DFCM.

ARTICLE 15. AUTHORITY TO EXECUTE AND PERFORM AGREEMENT. Contractor and DFCM each represent that the execution of this Contractor's Agreement and the performance thereunder is within their respective duly authorized powers.

ARTICLE 16. ATTORNEY FEES AND COSTS. Except as otherwise provided in the dispute resolution provisions of the General Conditions, the prevailing party shall be entitled to reasonable attorney fees and costs incurred in any action in the District Court and/or appellate body to enforce this Contractor's Agreement or recover damages or any other action as a result of a breach thereof.

CONTRACTOR'S AGREEMENT
PAGE NO. 5

IN WITNESS WHEREOF, the parties hereto have executed this Contractor's Agreement on the day and year stated hereinabove.

CONTRACTOR: _____

Signature Date

Title: _____

State of _____)
County of _____)

Please type/print name clearly

On this ____ day of _____, 20____, personally appeared before me, _____, whose identity is personally known to me (or proved to me on the basis of satisfactory evidence) and who by me duly sworn (or affirmed), did say that he (she) is the _____ (title or office) of the firm and that said document was signed by him (her) in behalf of said firm.

(SEAL)

Notary Public

My Commission Expires _____

APPROVED AS TO AVAILABILITY
OF FUNDS:

Financial Manager, Date
Division of Facilities Construction
and Management

**DIVISION OF FACILITIES
CONSTRUCTION AND MANAGEMENT**

Manager - Date
Capital _____

APPROVED AS TO FORM:
ATTORNEY GENERAL
May 25, 2005
By: Alan S. Bachman
Asst Attorney General

APPROVED FOR EXPENDITURE:

Division of Finance Date

PERFORMANCE BOND
(Title 63, Chapter 56, U. C. A. 1953, as Amended)

That _____ hereinafter referred to as the "Principal" and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah, hereinafter referred to as the "Obligee," in the amount of _____ DOLLARS (\$ _____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____, for the approximate sum of _____ Dollars (\$ _____), which Contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall faithfully perform the Contract in accordance with the Contract Documents including, but not limited to, the Plans, Specifications and conditions thereof, the one year performance warranty, and the terms of the Contract as said Contract may be subject to Modifications or changes, then this obligation shall be void; otherwise it shall remain in full force and effect.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the state named herein or the heirs, executors, administrators or successors of the Owner.

The parties agree that the dispute provisions provided in the Contract Documents apply and shall constitute the sole dispute procedures of the parties.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the Provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20_____.

WITNESS OR ATTESTATION:

PRINCIPAL:

By: _____ (Seal)

Title: _____

WITNESS OR ATTESTATION:

SURETY:

By: _____
Attorney-in-Fact (Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney in-fact of the above-named Surety Company and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.

My commission expires: _____

Resides at: _____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General
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PAYMENT BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____, a corporation organized and existing under the laws of the State of _____ authorized to do business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); with its principal office in the City of _____, hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah hereinafter referred to as the "Obligee," in the amount of _____ Dollars (\$ _____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____ for the approximate sum of _____ Dollars (\$ _____), which contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall pay all claimants supplying labor or materials to Principal or Principal's Subcontractors in compliance with the provisions of Title 63, Chapter 56, of Utah Code Annotated, 1953, as amended, and in the prosecution of the Work provided for in said Contract, then, this obligation shall be void; otherwise it shall remain in full force and effect.

That said Surety to this Bond, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the Contract or to the Work to be performed thereunder, or the specifications or drawings accompanying same shall in any way affect its obligation on this Bond, and does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to the Work or to the specifications or drawings and agrees that they shall become part of the Contract Documents.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

WITNESS OR ATTESTATION:

PRINCIPAL:

By: _____ (Seal)

Title: _____

WITNESS OR ATTESTATION:

SURETY:

By: _____ Attorney-in-Fact (Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20____.

My commission expires: _____

Resides at: _____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

**Division of Facilities Construction and Management****CHANGE ORDER # _____**

CONTRACTOR: _____

AGENCY OR INSTITUTION: _____

PROJECT NAME: _____

PROJECT NUMBER: _____

CONTRACT NUMBER: _____

ARCHITECT: _____

DATE: _____

CONSTRUCTION CHANGE DIRECTIVE NO.	PROPOSAL REQUEST NO.	AMOUNT		DAYS	
		INCREASE	DECREASE	INCREASE	DECREASE

	Amount	Days	Date
ORIGINAL CONTRACT			
TOTAL PREVIOUS CHANGE ORDERS			
TOTAL THIS CHANGE ORDER			
ADJUSTED CONTRACT			

DFCM and Contractor agree that the terms, contract sum, scope of the Work and time specified in this Change Order shall constitute the full accord and satisfaction, and complete adjustment to the Contract and includes all direct and indirect costs and effects related to, incidental to, and/or reasonably implied from such change in the contract terms, sum, scope of the Work and time.

Contractor: _____

Date

Architect/Engineer: _____

Date

Agency or Institution: _____

Date

DFCM: _____

Date

Funding Verification: _____

Date

**CERTIFICATE OF SUBSTANTIAL COMPLETION**

PROJECT _____ PROJECT NO: _____

AGENCY/INSTITUTION _____

AREA ACCEPTED _____

The Work performed under the subject Contract has been reviewed on this date and found to be Substantially Completed as defined in the General Conditions; including that the construction is sufficiently completed in accordance with the Contract Documents, as modified by any change orders agreed to by the parties, so that the State of Utah can occupy the Project or specified area of the Project for the use for which it is intended.

The DFCM accepts the Project or specified area of the Project as Substantially Complete and will assume full possession of the Project or specified area of the Project at _____ (time) on _____ (date).

The DFCM accepts the Project for occupancy and agrees to assume full responsibility for maintenance and operation, including utilities and insurance, of the Project subject to the itemized responsibilities and/or exceptions noted below:

A list of items to be completed or corrected is attached hereto. The failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents, including authorized changes thereof.

The Contractor shall complete or correct the Work on the list of items appended hereto within _____ calendar days from the above date of issuance of this Certificate. The amount withheld pending completion of the list of items noted and agreed to shall be: \$_____.

CONTRACTOR (include name of firm) by: _____ DATE

A/E by: _____ DATE

USING INSTITUTION OR AGENCY by: _____ DATE

DFCM by: _____ DATE

cc: Parties Noted
DFCM, Director

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**ADMINISTRATIVE OFFICE OF THE COURTS
PROVO 4TH DISTRICT COURT
HVAC & CONTROLS UPGRADE**

DFCM PROJECT # 04200150



State of Utah—Department of Administrative Services

**DIVISION OF FACILITIES CONSTRUCTION
AND MANAGEMENT**

4110 State Office Building / Salt Lake City, Utah 84114 / 538-3018

SPECIFICATIONS

PREPARED BY

**WHW ENGINEERING INC.
1354 EAST 3300 SOUTH, SUITE 200
SALT LAKE CITY, UTAH 84106
PHONE: (801) 466-4021
FAX: (801) 466-8536**

APRIL 2005

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**DIVISION 01
GENERAL REQUIREMENTS**

01100	SUMMARY OF THE WORK
01200	DEFINITIONS AND STANDARDS
01300	PROCEDURES AND CONTROLS
01310	PROJECT MANAGEMENT AND COORDINATION
01400	PROJECT CLOSEOUT

SECTION 01100 - SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 Descriptive Summary of the Work:

- A. Without force and effect on the requirements of the Contract Documents, the description of the work of the Contract is summarized as follows:

1.2 Scope of the Work:

- A. Replace the existing controls system with a new DDC system.
- B. The contractor is responsible for the complete execution of the Contract Documents as indicated and specified. He is responsible for the work performed, the acts and omissions of his sub-contractors and suppliers and of persons either directly or indirectly employed by them, as well as the work, acts and omissions of persons directly employed by him.
- C. Provide, without additional charge, all incidental items required to complete the work even though not specifically indicated. Install all work so that its several component parts function together as a workable system, and with all equipment properly adjusted and in working order.
- D. Conform to the highest quality standards for materials and workmanship as required to execute work indicated, specified and necessary to fully satisfy the Contract requirements for a complete, finished and acceptable installation.
- E. The contractor is responsible to verify all field measurements of actual site conditions so that all work fits properly in the locations indicated and specified. Protect existing structures, improvements, landscaping, etc. from physical damage.
- F. Upon completion of the project, dismantle and remove from the site all barricade and construction materials.
- G. Any existing items which are damaged by the contractor shall be restored to their original or better condition to the satisfaction of the Owner.

1.3 Contractor use of Premises:

- A. General: During the Construction period, the Contractor will have full use of the designated portions of the Owner's property necessary to perform the work, store a reasonable amount of materials, placement of temporary facilities, and similar uses. The Contractor's use of the premises is limited insofar as Owner operations in existing facilities is concerned.
 - 1. The existing building, property and parking area will remain fully operational throughout the Construction Period. This work must be conducted in such a manner that no interference with such operations or with the safety of Owner's employees, or the public.

1.4 Permit Fees:

- A. DFCM does not require fees or permits and is the Governing Authority on this project.

- B. Other incidental fees required by other municipal agencies or utility companies are the responsibility of the Contractor.

1.5 Interruption of Existing Utilities:

- A. Whenever the work of this contract requires the temporary shutdown of any existing utilities, notify Physical Facilities Director 72 hours in advance and obtain written permission from him before shutting off any existing utilities. Minimize the interruption of existing mechanical, communications and electrical services which may affect other portions of the College operations.

1.6 Construction Documents:

- A. The Working Drawings which are listed in the following "Schedule of Drawings" constitute the visual construction guide.
- B. Working Drawings and Specifications are complimentary to each other and what is called for by one is as binding as if called for and defined by both. In case of conflict between the two, the Specifications take precedence unless they are obviously in error. Figured dimensions take precedence over scale measurements.
- C. In no case are manufacturer's or supplier's shop drawings to nullify, take precedence of, or supplant the Working Drawings.
- D. Specification Divisions are divided into the standard sixteen construction industry major divisions with all work being categorized into one such division. Individual elements of the work are subdivided into sections within each division. Such assignment of the work is not intended to limit the manner in which the Contractor chooses to assign the work.

1.7 Owner Occupancy:

- A. Partial Owner Occupancy: The Owner reserves the right to occupy completed areas of the building, prior to Substantial Completion provided that such occupancy does not interfere with completion of the work. Occupancy shall not constitute acceptance of the total work. All unaffected areas of the building shall remain in full use during construction.

1.8 Guarantee/Warranty:

- A. Notwithstanding other guarantees or warranties for specific components of the work, the entire work included in this contract shall be guaranteed for a period of one (1) year from the date of issuance of the Certificate of Substantial Completion against all defects in equipment, material, or workmanship.
- B. Furnish and pay for all labor, equipment, and material required to correct defects and deficiencies in the work without additional cost to the Owner and as approved by the Engineer.
- C. In addition to the general project warranty, specific project warranties are required. Requirements of the warranties are noted in the indicated Specification Sections.

PART 2-PRODUCTS
(Not Used)

PART 3-EXECUTION
(Not Used)

END OF SECTION 01100

SECTION 01200 - DEFINITIONS AND STANDARDS

PART 1-GENERAL

1.1 Definitions:

- A. General: Except as specifically defined otherwise, the following definitions shall supplement definitions of the Contract, General Conditions, Supplementary Conditions and other general contract documents, and apply generally to the work.
- B. General Requirements: The provisions of Division-1 sections, General Requirements, apply to the entire work of the Contract.
- C. Indicated: Shown on drawing by notes, graphics or schedules, or written into other portions of contract documents. Terms such as "shown", "noted", "schedules", and "specified" have same meaning as "indicated", and are used to assist the reader in locating particular information.
- D. Directed, Requested, Approved, Accepted, etc.: These terms imply "by the Architect/Engineer", unless otherwise indicated.
- E. Approved by Architect/Engineer: In no case releases Contractor from responsibility to fulfill requirements of contract documents.
- F. Project Site: Space available to Contractor at location of project, either exclusively or to be shared with separate contractors, for performance of work.
- G. Furnish: Supply and deliver to project site, ready for unloading, unpacking, assembly, installation, and similar subsequent requirements.
- H. Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar requirements.
 - 1. Provide: Furnish and install, complete and ready for intended use.
- I. Installer: Entity (firm or person) engaged to install work, by Contractor, subcontractor or sub-sub contractor. Installers are required to be skilled in work they are engaged to install.
- J. Specification Text Format: Underscoring facilitates scan reading, no other meaning. Imperative language is directed at Contractor, unless otherwise noted.
- K. Overlapping/Conflicting Requirements: Most stringent (generally) requirement written directly into the contract documents is intended and will be enforced, unless specifically detailed language written into the contract documents clearly indicates that a less stringent requirement is acceptable. Refer uncertainties to the Architect/Engineer for a decision before proceeding.
 - 1. Where optional requirements are specified in a parallel manner, option is intended to be Contractor's unless otherwise indicated.
- L. Minimum Requirements: Indicated requirements are for a specific minimum acceptable level of quality/quantity, as recognized in the industry. Actual work must comply (within specified tolerances), or may exceed minimums within reasonable limits. Refer uncertainties to Architect/Engineer before proceeding.
- M. Abbreviations, Plural Words: Abbreviations, where not defined in contract documents, will be interpreted to mean the normal construction industry terminology, determined by recognized grammatical rules, by the Architect/Engineer. Plural words will be interpreted as singular and singular words will be interpreted as plural where applicable for context of contract of documents.

- N. Testing laboratory: An independent entity engaged for the project to provide inspections, tests, interpretations, reports and similar services.

1.2 Standards and Regulations:

- A. Industry Standards: Applicable standards of construction industry have same force and effect on performance of the work as if copied directly into contract documents or bound and published therewith. Standards referenced in contract documents or in governing regulations have precedence over non-referenced standards, insofar as different standards may contain overlapping or conflicting requirements. Comply with standards in effect as of date of contract documents, unless otherwise indicated.
 - 1. Abbreviations: Where abbreviations or acronyms are used in contract documents, they mean the well recognized name of entity in building construction industry; refer uncertainties to Architect/Engineer before proceeding, or consult "Encyclopedia of Associations" by Gale Research Co.

PART 2-PRODUCTS

(Not Used)

PART 3-EXECUTION

(Not Used)

END OF SECTION 01200

SECTION 01300 - PROCEDURES AND CONTROLS

PART 1 - GENERAL

1.1 ADMINISTRATION AND SUPERVISION:

- A. Coordination: Coordinate various elements of the work and entities engaged to perform work; and coordinate the work with existing facilities/conditions, and with work by separate contractors (if any) and by Owner.

1.2 CONSTRUCTION PROGRESS DOCUMENTATION:

- A. Contractor shall maintain an overall general project schedule, as well as a detailed 3 week look ahead schedule. The schedules will be regularly updated and modified throughout the project. Upgrades and modifications shall be given to the Owner and Engineer.
- B. The Contractor shall maintain a record of all submittals, RFI's proposal requests, change orders, and all other written communications with Owner and Engineer.

1.3 SURVEY/RECORDING:

- A. General: Calculate dimensions and measure for layout of work; do not scale the drawings. Record deviations (if any) from drawing information on existing conditions, and review with Engineer at time of discovery.

1.4 INSPECTION AND TESTING:

- A. General: Provide required inspection and testing services specified to be by independent agencies, where not indicated specifically as Owner's responsibility (this provision supplements General Conditions). Neither inspection and test results nor failure thereof to disclose deficiencies relieves Contractor of responsibility to comply with requirements of contract documents. Provide services to inspection and testing agencies (Owner's and Contractor's), including taking and delivery of samples, patch work and similar assistance. Require engaged agencies to perform indicated testing and submit records promptly; and to report significant observations having an important bearing on the work, to the Architect/Engineer by the most expeditious means possible.

1.5 INSTALLATION, GENERAL:

- A. Comply with manufacturer's instructions and recommendations to extent printed information is more detailed or stringent than requirements contained directly in contract documents.
- B. Timing: Install work during time and under conditions which will ensure best possible results, coordinated with required inspection and testing. Timing is of the up most importance.
- C. Anchor work securely in place, properly located by measured line and level, organized for best possible uniformity, visual effect, operations efficiency, durability, and similar benefit to Owner's use. Isolate non-compatible materials from contact, sufficiently to prevent deterioration.

1.6 CLEANING AND PROTECTION:

- A. General: Clean each element of work at time of installation. Provide sufficient maintenance and protection during construction to ensure freedom from damage and deterioration at time of substantial completion.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION 01300

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. Administrative and supervisory personnel.
 - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.

4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Indicate relationship of components shown on separate Shop Drawings.
 2. Indicate required installation sequences.
 3. Refer to Division 15 Section "Basic Mechanical Materials and Methods" and Division 16 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for mechanical and electrical installations.
- B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
1. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner, and Engineer, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing.
 - d. Designation of responsible personnel.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for processing Applications for Payment.
 - g. Distribution of the Contract Documents.
 - h. Submittal procedures.
 - i. Preparation of Record Documents.
 - j. Use of the premises.
 - k. Responsibility for temporary facilities and controls.
 - l. Parking availability.
 - m. Office, work, and storage areas.
 - n. Equipment deliveries and priorities.
 - o. First aid.
 - p. Security.
 - q. Progress cleaning.
 - r. Working hours.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

- a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Required performance results.
 - u. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements.
 - 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Attend progress meetings at EVERY-OTHER-WEEK intervals. Coordinate dates of meetings with preparation of payment requests.
- 1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.

- 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 - 14) Documentation of information for payment requests.
3. Reporting: Engineer shall distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Coordination Meetings: Conduct Project coordination meetings as may be required. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 01400 - PROJECT CLOSEOUT

PART 1-GENERAL

1.1 Related Documents:

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and other division 1 specification sections shall apply to this section.

1.2 Summary:

- A. This section specifies administrative and procedural requirements for project closeout, including but not limited to:
 - 1. Inspection procedures.
 - 2. Project record document submittal.
 - 3. Operating and maintenance manual submittal.
 - 4. Submittal of warranties.
 - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate sections in division 2 through 16.

1.3 Substantial Completion:

- A. **Preliminary Procedures:**
 - 1. Before requesting inspection for certification of substantial completion, complete the following. List any exceptions in the request.
 - 2. In the application for payment that coincides with, or first follows, the date substantial completion is claimed, show 100 percent completion for the portion of the work claimed as substantially complete. Include supporting documentation for completion as indicated in these contract documents and a statement showing an accounting of changes to the contract sum.
 - a) If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the work is not complete.
- B. Advise Owner of pending insurance change-over requirements.
- C. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
- D. Obtain and submit releases enabling the owner unrestricted use of the work and access to services and utilities.
- E. Submit record drawings, maintenance manuals, and other similar final record information.
- F. Deliver spare parts, extra stock, and similar items.
- G. Complete testing of new system and instruction of the Owner's operating and maintenance personnel. Remove all construction tools, and similar elements.
- H. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore new and existing marred exposed finishes.

1.4 Inspection Procedures:

- A. On receipt of a request for inspection, the Engineer will either proceed with inspection or advise the contractor of unfilled requirements. The Engineer will prepare the Certificate of Substantial Completion following inspection, or advise the contractor of construction that must be completed or corrected before the certificate will be issued.
 - 1. The Engineer will repeat inspection when requested and assured that the work has been substantially completed.
 - 2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.5 Final Acceptance:

- A. Preliminary Procedures
 - 1. Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
- B. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
- C. Submit an updated final statement, accounting for final additional changes to the contract sum.
- D. Submit a certified copy of the Engineer's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Engineer.
 - 1. Submit consent of surety of final payment.
 - 2. Submit a final liquidated damages settlement statement.
 - 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

1.6 Reinspection Procedure:

- A. The Engineer will reinspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Owner and Engineer.
 - 1. Upon completion of reinspection, the Engineer will prepare a certificate of final acceptance, or advise the contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance. If necessary, reinspection will be repeated.

1.7 Record Document Submittals:

- A. General:
 - 1. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.

1.8 Record Drawings:

- A. Maintain a clean, undamaged set of blue or black line white prints of contract drawings and shop drawings. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 - 1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
 - 2. Mark new information that is important to the Owner, but was not shown on the contract drawings or shop drawings.
 - 3. Note related change order numbers where applicable.
 - 4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

1.9 Record Specifications:

- A. Maintain one complete copy of the project manual, including addenda, and one copy of other written construction documents such as change orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual work performed in comparison with the text of the specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and product data.
 - 1. Upon completion of the work submit record specifications to the Engineer for the Owner's records.

1.10 Record Product Data:

- A. Maintain one copy of each product data submittal. Mark these documents to show significant variations in actual work performed in comparison with information submitted. Include variations in product delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned later by direct observation. Note related change orders and mark-up of record drawings and specifications.
 - 1. Upon completion of mark-up, submit complete set of record product data to the Engineer for the Owner's records.

1.11 Miscellaneous Record Submittals:

- A. Refer to other specification sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Engineer for the Owner's records.

1.12 Final Cleaning:

- A. General cleaning during construction is required by the General Conditions.
 - 1. **Cleaning:** Employ experienced workers or professional cleaners for final cleaning. Comply with manufacturer's instructions.

1.13 Removal of Protection:

- A. Remove temporary protection and facilities installed for protection of the work during construction.

1.14 Compliance:

- A. Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
 - 1. Where extra materials of value remain after completion of associated work arrange for disposition of these materials as directed.

PART 2-PRODUCTS

(Not Used)

PART 3-EXECUTION

(Not Used)

END OF SECTION 01400

**DIVISION 15
MECHANICAL SPECIFICATION**

15000 GENERAL

15010 GENERAL REQUIREMENTS

15050 BASIC MATERIALS AND METHODS

15051 BASIC MATERIALS AND METHODS GENERAL REQUIREMENTS
15075 PIPE AND EQUIPMENT IDENTIFICATION

15080 MECHANICAL INSULATION

15081 DUCT INSULATION

15100 BUILDING SERVICES PIPING

15101 PIPE AND PIPE FITTINGS
15182 HYDRONIC PIPING AND SPECIALTIES

15800 AIR DISTRIBUTION

15812 ROUND STEEL DUCTWORK
15813 MEDIUM VELOCITY DUCTWORK (PRESSURE CLASS 2" & 3" SEAL CLASS B)
15816 STEEL DUCTWORK
15818 FLEXIBLE DUCT
15819 DUCTWORK TESTING
15820 DUCT ACCESSORIES
15822 DUCT LINER
15823 ROUND DUCT LINER
15841 PRESSURE INDEPENDENT VAV BOXES
15851 DIFFUSERS, REGISTERS, AND GRILLES

15900 HVAC INSTRUMENTATION AND CONTROLS

15910 AUTOMATIC TEMPERATURE CONTROLS

15950 TESTING, ADJUSTING AND BALANCING

15960 AIR SYSTEM TEST AND BALANCE
15970 WATER SYSTEM TEST AND BALANCE

SECTION 15010 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL:

- A. General Conditions and Division 01 apply to this Division.

1.2 SCOPE:

- A. Includes -
 - 1. Furnish all labor, materials, and equipment necessary for completion of the mechanical work for the Provo 4th District Court HVAC and Controls Upgrade – DFCM #0420015
 - 2. Mechanical Contractor shall obtain the services of independent Test and Balance Agency.
 - 3. Placing the air conditioning, heating, ventilating, and exhaust systems into full operation and continuing their operation during each working day of testing and balancing.
 - 4. Making changes in pulleys, belts, and dampers, or adding dampers, as required for the correct balance as recommended by Balancing Contractor at no additional cost to Owner.
 - 5. Air balance, final adjustment and test run.
 - 6. The satisfactory performance of the completed systems is a requirement of this specification.

1.3 SITE INSPECTION:

- A. The Contractor shall examine the site and understand the conditions which may affect the performance of work of this Division before submitting proposals for this work.
- B. No subsequent allowance for time or money will be considered for any consequence related to failure to examine existing site conditions.

1.4 DRAWINGS:

- A. Mechanical drawings show general arrangement of piping, ductwork, equipment, etc; however, locations are to be regarded as shown diagrammatically only. Follow as closely as actual building construction and work of other trades will permit.
- B. Because of the small scale of mechanical drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate existing structural and finished conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- C. If changes in location of piping, equipment, ducts, etc. are required due to lack of coordination of work under this division, such changes shall be made without charge. Contractor shall review drawings with local and state agencies having

jurisdiction and any changes required by them shall be brought to the attention of the Engineer prior to bidding or commencement of work.

1.5 SHOP DRAWINGS: (NOT EQUIPMENT SUBMITTALS)

1.6 CODE REQUIREMENTS, FEES, AND PERMITS:

- A. The work shall be installed in accordance with the following applicable codes, ordinances and standards unless otherwise specified. The codes and standards shall include but not be limited to and be of the latest and current editions.
1. American Boiler and Affiliated Industries (AB and AI)
 2. American Gas Association (AGA)
 3. Air Movement and Control Association (AMCA)
 4. American National Standards Institute (ANSI)
 5. Air Conditioning & Refrigeration Institute (ARI)
 6. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 7. American Society of Mechanical Engineers (ASME)
 8. American Society of Testing Materials (ASTM)
 9. American Standards Association (ASA)
 10. American Water Works Association (AWWA)
 11. American Welding Society (AWS)
 12. Associated Air Balance Council (AABC)
 13. Heat Exchange Institute (HEI)
 14. Hydraulic Institute (HI)
 15. IBR
 16. National Electrical Code (NEC)
 17. National Fire Protection Association (NFPA)
 18. Sheet Metal and Air Conditioning contractors National Association (SMACNA)
 19. Underwriters Laboratories (UL)
 20. International Building Code (IBC) 2003 Ed
 21. International Mechanical Code (IMC) 2003 Ed
 22. International Plumbing Code (IPC) with Utah Amendments 2003 Ed
 23. Utah State Safety Orders (OSHA/UOSH)
 24. Utah Fire Rating Bureau
 25. Utah Boiler and Pressure Vessel Law
 26. Utah Air Conservation Regulations/Waste Disposal regulations.
 27. ASHRAE Ventilation STD.62-2001.
 28. Energy Code for Commercial and High Rise Building ASHRAE/IES NA 90.1-2001.
- B. Should drawings conflict with any code, the code shall govern. If drawings and specifications establish a quality exceeding the code, the drawings and specifications shall govern. If conflicts do exist among the drawings, specifications and codes, the same shall be brought to the attention of the Engineer in writing prior to bidding, otherwise Contractor shall comply with applicable codes.
- C. The latest edition of all codes shall be used.
- D. Contractor shall give all notices, obtain all necessary permits, file necessary plans, prepare documents and obtain approvals, and pay all fees required for

completion of the mechanical and plumbing work outlined in this Division of the specifications and shown on the Mechanical Drawings.

1.7 OPERATION AND MAINTENANCE MANUAL FOR MECHANICAL SYSTEMS:

- A. Upon completion of work and before final payment, Contractor shall furnish and deliver to the Owner, through the Engineer, three (3) sets of installation, operating and maintenance manuals and instructions for all new materials and mechanical equipment used in the building.
- B. Bind Operation and Maintenance Manual for Mechanical Systems in a hard-backed piano hinge loose-leaf binder with strong sturdy cover. The following lettering shall be stamped on front and spine of each binder:

OPERATION
AND
MAINTENANCE
MANUAL
for MECHANICAL SYSTEMS of
Provo 4th District Court
HVAC and Controls Upgrade
Provo, Utah
WHW Engineering Inc.

- C. The first section is to contain the following information.
 - 1. First page shall be a table of contents including name of project, date awarded and date of substantial completion.
 - 2. Second page shall contain the names, phone numbers and addresses of Consulting Engineers, and Associates.
 - 3. Third page shall contain a list of names, addresses and phone numbers of contractors and all sub-contractors and work to which each was assigned.
 - 4. Final page or pages shall contain an equipment list. The list shall contain each item of equipment or material for which a submittal was required giving ID or tag no as contained on the drawings make and model No. Serial No. Identification No. Location in building, function and name address and phone number of supplier.
- D. The second section shall contain
 - 1. Description of each operating system included location of switches, breakers thermostats control devices. Provide a single line diagram, showing set points, normal operating parameters for all loads, pressures, temperatures and flow check points; Describe all alarms and cautions for operation.
 - 2. Provide schematic control diagrams, panel diagrams, wiring diagrams etc (blue line prints) for each separate fan system, chilled water system, hot water system, exhaust air system, pumps, etc. each control diagram shall show a schematic representation of mechanical equipment and location of start-stop switches, insertion thermostats, thermometers, pressure gauges, automatic valves etc. The correct reading for each control instrument shall be marked on the diagram.

- E. The third section shall contain a complete air and water test and balance report. The report shall contain name, address and phone number of agency. Name and certification of their mechanical engineer, list of equipment with date of last calibration.
 - 1. Floor plans showing all air openings and thermometer location clearly marked and cross reference with data sheets. Formatted may be 8 1/2 x 11 or 11x14 if legible.
 - 2. Data sheets showing amount of air handled at each setting see section 15960 and 15970.
- F. The final sections shall be one for each individual item for which a submittal sheet was required. Each section shall include:
 - 1. Equipment descriptions
 - 2. Detailed installation instruction, operating and maintenance instructions (provided more than just product operations and maintenance instructions provided with unit where required. Instructions should be written in a step by step manner identifying start-up, operating, shutdown and emergency action sequence sufficiently clear so a person unfamiliar with the equipment could perform its operations.
 - 3. Equipment drawings, performance curves, operating characteristics, etc.
 - 4. Name addresses and phone number of manufacturer, fabricator and local vender clearly printed or stamped on cover.
 - 5. Complete parts listing which include catalog number, serial number, contract number or other accurate provision for ordering replacement and spare parts.
 - 6. Certified drawings, where applicable, showing assembly of parts and general dimensions.
 - 7. General product and approved submittal sheets.
- G. Drawings and reproducible masters of drawings as required in individual specification sections, are not to be bound in volumes but are to be delivered separate with the maintenance manuals.
- H. Equipment to be covered:
 - 1. Mechanical equipment
 - 2. Plumbing fixtures and equipment.
 - 3. Automatic controls and sensing systems
 - 4. Any item for which a submittal is required.

1.8 OPERATION AND MAINTENANCE INSTRUCTIONS:

- A. Contractor shall instruct building maintenance personnel in the operation and maintenance of the installed mechanical systems utilizing the Operation and Maintenance Manual when so doing.
- B. Minimum instruction periods shall be as follows -
 - 1. Mechanical - Two hours.
 - 2. Temperature Control Eight hours.
- C. Instruction periods shall occur before final inspection when systems are properly working and before final payment is made.
- D. None of these instructional periods shall overlap each other.
- E. An additional four hours of instruction will be provided by each contractor, after 60 days of system operation by owner to insure proper system operation and answer questions.

1.9 RECORD DRAWINGS:

- A. Contractor shall keep an up-to-date set of mechanical and plumbing drawings in his custody showing all changes in red, clearly defined and neatly drafted by him. At the end of construction, he shall turn these drawings over to the Engineer. Record drawings must be completed and submitted prior to final inspection.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION 15010

SECTION 15051 - BASIC MATERIALS & METHODS GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL:

- A. Division 15010 General applies to this Section.

1.2 COORDINATION OF WORK:

- A. It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for the installation of systems according to the true intent and meaning of the Contract Documents. Anything not clear or in conflict will be explained by making application to the Engineer in writing. Should conditions arise where certain changes would be advisable, secure Owner's and Engineer's approval for these changes before proceeding with work.
- B. Coordinate work of various trades in installing interrelated work. Before installation of mechanical items, make proper provision to avoid interferences in a manner approved by Engineer. Changes required in work specified in Division 15 caused by neglect to secure approval shall be made at no cost to Owner.
- C. Arrange piping, ductwork, and equipment to permit ready access to valves, unions, starters, motors, control components, and to clear openings of doors and access panels. Contractor shall provide all necessary access doors and/or panels to provide complete access to all mechanical equipment, dampers, or accessories. Doors for dampers, etc. shall be minimum 12" x 12" and doors for mechanical equipment shall be minimum 24" x 24".
- D. Be responsible for required digging, cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of Owner and Architect. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.
 - 1. Patch and repair walls, floors and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
 - 2. This Division shall bear expense of cutting, patching, repairing, and replacing of work of other Divisions because of its fault, error, tardiness, or because of damage done by it.
 - 3. Provide the necessary cutting, patching, repairing, and replacing pavements, sidewalks, etc. to permit installation of work of this Division.
- E. Adjust locations of piping, ductwork, equipment, etc, to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe and cut prior to fabrication.
 - 1. Make offsets, transitions, and changes in direction of piping, ductwork, and electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
- F. This Contractor shall schedule his work, store his equipment and materials, and work in harmony with other Contractors so as to not delay or jeopardize the construction.

1.3 EQUIPMENT & MATERIALS:

- A. Requests for substitution shall be received in writing a minimum of seven days prior to bidding. Prior acceptance shall be by Manufacturer's name only. Items not listed in this specification or subsequent addendums shall not be considered. No oral approvals will be acceptable. Manufacturers listed in this specification are acceptable only for items listed. All other items manufacturer wishes to bid must be prior approved. All equipment shall be subject to final review in accordance with "Project Submittals".
- B. Product Approvals -
 - 1. If approval is received to use other than specified items, responsibility for specified capacities and insuring that items to be furnished will fit space available lies with this Division.
 - 2. In the event other than specified equipment is used and will not fit job site conditions, this Division assumes responsibility for replacement with items named in Specification.
- C. Use domestic made pipe, pipe fittings, and motors on Project.
- D. Motor and equipment name plates as well as applicable UL labels shall be in place when Project is turned over to Owner.
- E. Insure that items to be furnished fit spaces available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. Do not scale off drawings.
- F. All materials shall be of the best commercial quality obtainable, consistent with specified materials and for the purpose or function intended. Materials shall be new unless specifically excepted.
- G. Equipment catalog or model numbers shown define the basic equipment types and quality standard only. Catalog numbers shall not be considered as all inclusive and shall be verified to include all devices, controls, operators, and appurtenances necessary for the satisfactory and complete operation of the equipment.
- H. Follow manufacturer's directions in delivery, storage, protection, and installation of equipment and materials.
 - 1. Promptly notify Engineer in writing of conflicts between requirements of Contract Documents and Manufacturer's directions and obtain Engineer's written instructions before proceeding with work. Contractor shall bear all expenses arising from correcting deficiencies of work that does not comply with Manufacturer's directions or such written instructions from .
- I. Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or mechanical injury but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in a dry, heated space.

1.4 PROJECT SUBMITTALS:

- A. Furnish complete catalog data for manufactured items of equipment to be used in the Work to for review within 15 days after award of Contract.
- B. Submittal shall include, but not be limited to the following:
 - 1. equipment scheduled
 - 2. balancing contractor

3. insulation
4. grilles, and diffusers
5. automatic temperature controls
6. certificates of guarantee
7. valves
8. any item for which more than one manufacturer is mentioned
- C. Submit a minimum of five copies of data in binders and index in same order and name as they appear in Specification.
 1. State sizes, capacities, brand names, motor HP, electrical requirements, accessories, materials, gauges, dimensions, and other pertinent information.
 2. List on catalog covers page numbers of submitted items.
 3. Underline or highlight applicable data.
- D. If material or equipment is not as specified or submittal is not complete, it will be rejected.
- E. Catalog data or shop drawings for equipment which are noted as being reviewed by shall not supercede Contract Documents.
- F. Review comments of shall not relieve this Division from responsibility for deviations from Contract Documents unless attention has been called to such deviations in writing at time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.
- G. Check work described by catalog data with Contract Documents for deviations and errors.
- H. All items other than first named specified equipment shall show and state all exceptions and deviations taken and shall include design calculations and drawing layouts.
- I. The Contractor shall review the submittals prior to submission to the to make sure that the submittals are complete in all details. No submittal will be reviewed which does not bear the contractor's notation that such checking has been made.
- J. No partial submittals will be considered unless approved by the
- K. Manufacturers' names shall be mentioned as acceptable prior to bidding.
- L. Contractor shall verify equipment dimensions to fit the spaces provided with sufficient clearance for servicing the equipment.
- M. Contractor shall review equipment submittals for compliance with schedules, specifications, and drawing plans and details. Equipment submittal shall show the proper arrangements to suit installation and maintenance such as motor location, access doors, filter removal, piping connections, etc.
- N. Equipment submittal sheets shall be clearly marked indicating equipment symbol and exact selection of proposed equipment. Submittals shall clearly indicate name of manufacturer of each item.
- O. For unacceptable items, the right shall be reserved to require the first named specified items.
- P. Where submittals are sent to with any of the above listed information missing or are incomplete they will be returned to the contractor unchecked to be completed and resubmitted. No additional time or money shall be allowed for failure to provide complete submittals on the first review.
- Q. If an item requiring submittal review is ordered, purchased, shipped, or installed prior to the submittal review and is subsequently disapproved the item shall be removed from the job site and replaced with an approved item at contractors expense.

1.5 CLEANING & FINISHING:

- A. Contractor shall, at all times, keep the premises free from waste material and rubbish. Upon completion of this Section of the work, Contractor shall remove all surplus materials and rubbish; clean all spots resulting from the mechanical work from hardware, floors, glass, walls, etc.; do all required patching up and repair all work of other trades damaged by Contractor under this Section of the work, and leave the premises in a clean orderly condition. Clean heating and cooling coils, internally and externally, and replace all air filters prior to final mechanical inspection. Remove rust, plaster, dirt, grease and oil before painting, insulating, or exposing to view the equipment, piping, ductwork, etc. in completed structure. Refinish any damaged surfaces and leave in proper working order at final completion.

1.6 SUPERVISION:

- A. The Contractor shall supervise and direct the work with his best skill and attention. He will be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor will be responsible to see that the finished work complies accurately with the Contract Documents.

1.7 SAFETY REGULATIONS:

- A. Contractor shall provide equipment, supervision, construction, procedures, and everything necessary to assure safety of life or property.
- B. Refer also to General Condition and Special Conditions for protection clauses.

1.8 LEAK DAMAGE:

- A. Contractor shall be responsible for damages to the work of other Contractors or to the building, or to its contents, people, etc., caused by leaks in any of the equipment or piping installed by him through equipment or material failures, leaking joints or disconnected pipes, fittings, or by overflows and shall make at his own expense all repairs to fixtures, building interior, contents, paint, rugs, furniture, ceiling tile, and equipment so damaged.

1.9 TOOLS AND STORAGE OF EQUIPMENT:

- A. The Contractor shall furnish all necessary tools, staging and whatever may be necessary for the installation of this work and shall at all times protect this work and others, and the materials to be used therein from damage by the weather, accident and other causes, and shall repair and make good any damage thus occurring.

1.10 WORKMANSHIP:

- A. Workmanship shall be the best quality of its kind for respective industries, trades, crafts and practices and shall be acceptable in every respect to the Owner and

Engineer. Nothing contained herein shall relieve the Contractor from performing good work, perfect in all details of construction.

1.11 TEMPORARY FACILITIES:

- A. Furnishing of temporary water, space heating, sanitary facilities, drainage lines, light and power will be as specified in Division 01 General Conditions. Contractor shall arrange to bring facilities to required location of premises. All expenses involved shall be paid by the Contractor as described in General and Special Conditions.

1.12 CONTRACTOR'S USE OF BUILDING EQUIPMENT:

- A. The Contractor may use equipment such as electric motors, fans, filters, etc. when permanently installed as part of the project and with the written permission of the Owner. As each piece of equipment is used, maintenance procedures approved by the manufacturer shall be followed, a careful record shall be kept of the time used, maintenance procedure following and of any difficulty experienced with equipment. The Contractor's records on the equipment shall be submitted to the Owner upon acceptance of project. All fan belts and filter media shall be new at the beginning of the Mechanical System Operating Test Run and System Balancing. Wearing surfaces (such as bearings) shall be carefully inspected just prior to acceptance. Any excessive wear noted shall require replacement.

1.13 INSPECTION NOTICE:

- A. The following is a basic list of guideline items so that the Architect, district building inspector/Owner's representative can be at job site for these inspections as the building progresses. Mechanical Contractor shall inform these people one week in advance of test time.
 - 1. Pressure tests on hot, chilled, and condenser water supply and return piping.
 - 2. All duct work prior to installation of finished ceilings, including ductwork pressure testing.
 - 3. Any changes or problems occurring at job site.
 - 4. Periodic inspection at their discretion will be made to insure compliance to Contract Documents and codes. Contractor shall provide ladders, access and other assistance as requested during inspections.
 - 5. Final inspection before giving approval for final payment.

1.14 WARRANTY GUARANTEE:

- A. The Contractor shall warrant all materials and equipment to be of quality consistent with specifications as represented by manufacturer's published data.
- B. The Contractor shall guarantee that the installation and operation of the equipment shall be free from defects for a period of one year beginning at date of substantial completion and acceptance. The Contractor shall replace or repair any part of the installation that is found to be defective or incomplete within the guarantee period.

- C. The one year guarantee on equipment and systems shall commence when equipment has been demonstrated to work and has been accepted. (Example: If an equipment item fails to perform and it takes 9 months after substantial completion to correct, then the guarantee shall commence after the item has been demonstrated to perform and has been accepted.)
- D. Substantial completion and acceptance in no way relieves the Contractor from providing the systems and equipment as specified.

1.15 COMPLETION SCHEDULE:

- A. Start-up and verification of basic equipment items shall be done prior to the date of substantial completion with sufficient time to allow balancing and adjusting to be performed.
- B. At the time of the final inspection a date shall be agreed upon for completion of any remaining items. At least double the estimated cost of the work will be withheld from the Contractor's payment.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION 15051

SECTION 15075 - PIPE AND EQUIPMENT IDENTIFICATION

PART 1 - GENERAL

1.1 SCOPE:

- A. Piping Identification
 - 1. All new pipes, or new pipe insulation shall be labeled and color coded with contents clearly identified and arrows indicating direction of flow. This applies to piping run above the ceilings as well as pipe exposed in equipment rooms and finished areas. Pipes shall be identified at the following locations:
 - a. Adjacent to each valve.
 - b. At every point of entry and exit where piping passes through a wall or floor.
 - c. On each riser and junction.
 - d. A maximum of every 50 feet on long continuous lines fully exposed to view. Less spacing if one cannot see one code from the adjacent.
 - e. Adjacent to all special fittings or devices (regulating valves, etc..
 - f. Connection to equipment.
- B. Equipment Identification
 - 1. Identify all **new and existing** equipment including gauges, meters, thermostats, mechanical equipment, ATC panels, junction boxes, and all other devices.
- C. Valve Tagging
 - 1. All existing control valves, and any other new valves shall be designated by distinguishing numbers and letters on required charts and diagrams. The Contractor shall furnish and install approved brass tags for all designated items, with numbers and letters on the tags corresponding to those on the charts and diagrams.
 - 2. Each valve shall have an identifying number identifying the unit. Standard identifications may be used for identifying type of service or fluid in pipe. The Contractor shall submit his system of identification to the Owner and Architect for approval prior to ordering. Any work done without this approval is done at the Contractor's own risk.
 - 3. Charts of all valves shall be furnished to Owner in duplicate by the Contractor. Charts shall indicate the following items:
 - a. Valve identification number
 - b. Location
 - c. Service or purpose
 - d. Normal Position

PART 2 - MATERIALS

2.1 PIPING IDENTIFICATION:

- A. Labels and markers shall be of the self-sticking, all-temperature permanent type as manufactured by W. H. Brady Co., 727 West Glendale Ave., Milwaukee, Wisconsin; or Seton Name Plate Corp., 592 Boulevard, New Haven, Connecticut.
- B. Pipe color coding shall be uniform throughout the building and comply with requirements of ANSI A13.1.
- C. All paint to be Enamel, Moore Impervo and Iron Clad.
- D. Letters of identification legend and directional flow arrows shall be 2" high for pipes 3" and larger, and 1" high for pipes 2-1/2" and under.
- E. Proposed identification system shall be approved by Owner and Architect prior to installation.

2.2 EQUIPMENT IDENTIFICATION:

- A. Equipment shall be identified with signs made of laminated plastic with 1/8" or larger engraved letters. Signs shall be securely attached by rust proof screwed or some other permanent means (no adhesives).
- B. Information on signs shall include name of equipment, identification on plans and schedules, rating maintenance instructions and any other important data not included on factory attached name plate.

2.3 VALVE TAGGING:

- A. Brass tags shall not be less than 1-1/2" diameter with depressed black-filled numbers not less than 1/2" high and black-filled letters not less than 1/4" high. Tags shall be securely fastened to valves with approved brass "S" hooks, or brass jack chain, in a manner to permit easy reading. Do not attach to valve wheel. Brass tags shall be as manufactured by Seton Name Plate Company, New Haven, Connecticut or approved equal.
- B. Permanent plastic cover for chart shall have two (2) holes to be punched at top of plastic closure to allow for affixing approximately an 8" length of nickel plated bead chain. Each hole to be reinforced by means of a small brass or nickel grommet. Plastic closure shall be as manufactured by Seton Name Plate Company, New Haven, Connecticut, or equal.

PART 3 - EXECUTION

3.1 PIPING IDENTIFICATION:

- A. Markers shall be installed in strict accordance with manufacturer's instructions. Use vinyl tape first and stick markers over tape. This procedure assures that the tape will not fall off.
- B. On chalky and loose insulation, soft, porous, fiber-filled or fiberglass covering, a spiral wrap of pipe banding tape shall be made around the circumference of the pipe. Sufficient spiral wraps shall be made to accommodate the horizontal dimension of the pipe marker.
- C. On bare pipes, painted pipes, and pipes insulated with a firm covering pipe banding tape matching the background color of the marker shall be used. After applying pipe markers, wrap pipe banding tape around pipe at each end of

- marker. Tape should cover 1/4" to 1/2" to 1" on itself. Be sure pipe surface is dry and free of dirt or grease before applying markers or banding tape.
- D. Stenciling may be used in lieu of the above labels and markers if finished application gives the same overall appearance, that is that stenciling is applied over a background color. If stenciling, is used, letter heights, background colors, banding and arrows shall be as specified above. Submit sample to Owner before proceeding with work.
 - E. Apply markers so they can be read from floor.

3.2 EQUIPMENT IDENTIFICATION:

- A. Signs shall be attached to equipment so they can be easily read. Attachment shall be by screws or rivets. Glue shall not be used.
- B. A sample identification sign for equipment shall be as follows: AH-1 Air handler single zone Gymnasium 8000 cfm.
- C. NOTE: Avoid using only the engineers designations as used on plans; identify equipment as to area or zone served.

3.3 REMOVABLE AND NON-REMOVABLE CEILING TILE:

- A. Where valves, VAV boxes, fire dampers, adjustment controls, etc. are located above ceiling tile, an identification on the lay in tile tee bar shall be provided to indicate the tile to be removed for access to a particular item. In general, 1/2 inch high black stick on or stencil letters are to be used indicating the device such as VAV for VAV box, CWV for cold water valve, FD for fire damper, E for other electrical devices, etc. The code used shall be provided in the operations and maintenance manual.
- B. For non-accessible ceiling and ceilings without tee bars, provide hinged access doors at each valve, fire damper, damper operator and VAV box.

3.4 VALVE TAGGING:

- A. Provide one valve chart mounted in a frame with clear glass front, and secured on a wall in the equipment rooms, or in a location as otherwise directed by the Architect.
- B. Provide a second valve chart for use outside of the equipment room. Chart shall be provided with an approved heavy transparent plastic closure for permanent protection.
- C. Identify all valves. A sample identification as follows:

VALVE #1
COLD WATER
OPEN

- D. Sample Identification Chart is as follows:
The room numbers used on the actual chart shall be the room numbers actually used. Do not use architectural room numbers shown on plans.

SAMPLE VALVE IDENTIFICATION CHART

NUMBER	DESCRIPTION	LOCATION	NORMAL POSITION
1.	Cold water supply to hose bibb.	Room #	Open
2.	Hot water supply to toilet room.	Chase #	Open

END OF SECTION 15075

SECTION 15081 - DUCT INSULATION

PART 1 - GENERAL

1.1 SCOPE:

- A. Includes -
 - 1. Insulating of concealed round above grade supply air ducts that are not lined. All ductwork routed outside of building insulation envelope.
 - 2. Insulation shall have surface burning characteristics as determined by ASTM E84 with a flame spread rating of 25 and a smoke developed of 50.
- B. Related Work specified Elsewhere -
 - 1. Acoustical insulation inside air ducts is specified in Section 15822.
 - 2. Insulated flex duct specified in Section 15818.

PART 2 - PRODUCTS

2.1 INSULATION:

- A. 1-1/2 inch thick fiberglass with aluminum foil scrim kraft facing and have a density of one lb/cu ft.
- B. Approved Manufacturers:
 - 1. Johns-Manville Microlite FSK
 - 2. CSG Type IV standard duct insulation
 - 3. Owens-Corning FRK-25
 - 4. Knauf (Duct Wrap FSK)

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install duct wrap in accordance with Manufacturer's recommendations.
- B. Do not compress insulation except in areas of structural interference.
- C. Joints shall be completely sealed.

END OF SECTION 15081

SECTION 15101 - PIPE AND PIPE FITTINGS

PART 1 - GENERAL

1.1 RELATED SECTIONS:

- A. Division 15010 General applies to this Section.

1.2 SCOPE:

- A. Includes -
 - 1. General piping installation, materials and procedures for all piping systems.
- B. Related Work Specified Elsewhere -
 - 1. Type of pipe and fittings for culinary water, heating hot water, chilled water, condenser water, drainage, etc. shall be specified in that particular Section.

PART 2 - PRODUCTS

2.1 HANGERS:

- A. Provide one of the following types of hangers for horizontal piping. Comparable products of Grinnell, Globe Pipehanger, B-Line, Michigan Hanger, Superstrut or Piping Technology and Products (PTP) considered equal.
- B. Except as otherwise specified hereinafter: Clevis type, B-Line Fig. B3100.
- C. Where pipe exceeds maximum loading recommended for Clevis type Hangers, provide steel pipe clamp, B-Line Fig. B3140 or Fig. B3142, depending on loading.
- D. Provide trapeze hangers where several pipes can be installed parallel and at the same level. Trapeze hangers shall consist of 2 steel channels bolted back to back spaced for rod hangers at each end. Use roller chairs B-Line B3120 pipe roll stands B-Line B3117 SL where provision for expansion is required.
- E. Supporting rods shall be attached to concrete by inserts placed before concrete is poured for pipes up to 8 inches.
- F. Supporting rods over 18 inches long shall be braced at every fourth hanger with diagonal bracing attached to slab or beam.
- G. Spring hangers shall be used for support of pipe within 100 diameters distance of coils, or pumps, as needed to isolate vibration. Springs shall be sized 1" static deflection. Vibrex type HXAP-PC adjustable spring hangers.
- H. For copper tubing use copper hanger; or dielectrically isolate.

2.2 CLAMPS:

- A. Beam clamps shall be malleable iron, B-Line Fig. B442 for 1/4 inch hanger rods; forged steel beam clamp, B-Line B321 for hanger rod up to 1-1/2 inches.

2.3 PIPE COVERING PROTECTION:

- A. Provide calcium silicate blocks in the bottom 1/2 diameter of pipe to protect insulation at areas of contact with hangers and supports. Material shall be 8 inches long for pipes up to 3 inches and 12 inches long for pipes 3-1/2 inches and larger. Insulation manufacturer supplied inserts shall be acceptable.

2.4 UNIONS AND COUPLINGS:

- A. Unions: Malleable iron, brass to iron seat, ground joint, same materials as pipe. Crane, Walworth, or approved equal.
- B. Dielectric Unions: Mechanical Contractor shall install dielectric union or couplings whenever copper pipe connects to steel pipe or other items of equipment. Couplings and unions shall be as manufactured by the Water Vallot Company of Detroit, Michigan, or approved equal.

2.5 PIPING SPECIALTIES:

- A. Provide thermometers, pressure gages, vents, tank fittings, and other miscellaneous piping specialties as shown or as may be required by usual good practices for a complete system.
- B. Thermometers shall be 9" scale, red reading, glass covered, immersion type with separable sockets. Marshall-Town, Moeller, Trerice, Weskler, or Weiss, with neck extension to accommodate insulation.
- C. Pressure gages shall be 4-1/2" diameter dial, molded case dust proof, phosphor bronze, bourdon tube type installed with integral check screw or pressure snubber. Marshalltown 224, U.S., Ashcroft, Trerice or Marsh.
- D. Manual air vents shall be installed at all high points in piping system and drain valves at system low points. Manual air vents shall be 3/8" globe valves on 6" long pipe nipple with 1/4" copper tubing to near floor. Drain valves shall be fitted for 3/4" hose connection with vacuum breaker. Provide access for valves.

2.6 STRAINERS:

- A. Walworth 3699 - 1/2 Sarco SB; bronze, smaller than 2-1/2 inches. Bailey 125 pound No. 100; Zurn 125 pound No. 540 FPS; or Crane No. 989-1/2, cast iron 2-1/2 inches and larger. Water straining element shall be perforated 20 mesh monel screen. Strainers shall be designed for the same working pressure as the control valves. Provide strainer blowoff port with line size hose bibb and vacuum breakers.

2.7 VALVES:

- A. Provide on each valve a name plate showing manufacturer, valve size, grade, and pressure temperature service rating.
- B. See specific piping system sections for valves to be used in that system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All drainage of existing piping and new fill including chemical treatment shall be the responsibility of this contractor. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.
- B. Properly support piping and make adequate provision for expansion, contraction, slope, and anchorage.
 - 1. Cut piping accurately for fabrication to measurements established at site and work into place without springing or forcing.
 - 2. Do not use pipe hooks, chains, or perforated metal for pipe support.
 - 3. Remove burr and cutting slag from pipes.
- C. Piping shall not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings. Provide accessible, ground joint unions in piping at connections to equipment.
- D. Make connections of dissimilar metals with insulating couplings.
- E. Provide sleeves around pipes passing through floors, walls, partitions, or structural members.
 - 1. Seal sleeves with plastic or other acceptable material.
 - 2. All piping passing through floors and outside walls and foundations shall have a water tight sleeve and water tight caulking around pipe. Extend pipe sleeve minimum of 3 inch above floor.
- F. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of systems. Do not use plugs of rags, wool, cotton waste, or similar materials.
- G. Install piping systems so they may be easily drained.
- H. Do not place water piping within building perimeter in contact with earth.
- I. Valves of same type shall be of same Manufacturer.
- J. Do not use reducing bushings, street elbows, or close nipples.
- K. Make changes in direction with proper fittings. Bending of pipe is not approved.
- L. Hanger rods shall be of a diameter adequate to support pipe size.
- M. Install additional supports as required.
- N. Suspend all piping in building except that underground. Laying of piping on any building member is not allowed.
- O. Design all hangers to support the required loads. Where necessary, supports shall be designed to permit movement due to expansion and contraction. Where drawings show details of supports and anchors, conform to details shown. Where details are not shown, conform to General Requirements specified in sub-paragraph.
- P. Horizontal Piping Support Schedule: Support horizontal piping of steel, cast iron, plastic, and copper as follows:

HORIZONTAL PIPING SUPPORT SCHEDULE

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1-1/4"	3/8"	8'-0"
1-1/2" and 2"	3/8"	10'-0"
2-1/2" and 3"	1/2"	10'-0"
4" and up	5/8"	12'-0"

- Q. Piping with nonpressure type joints such as Soil and Waste Piping shall be supported with a minimum of two hangers per pipe section.
- R. Support horizontal lines of copper tubing with hangers. Space not more than 8 feet center to center.
- S. Cutting or other weakening of the building structure to facilitate installation will not be permitted. The Contractor shall demonstrate that no weight or stress is placed upon the equipment by the piping and that piping and connection of equipment are in perfect alignment. When so directed, disconnection and reconnection of piping shall be done by Contractor for designated pipe section to properly demonstrate stress; this shall be at no cost to Owner.
- T. Flanges or unions as applicable for the type of piping specified shall be provided in the piping at connections to all items of equipment. All piping shall be installed to insure noiseless circulation. All valves and specialties shall be placed, packed and adjusted at the completion of the work before final acceptance.
- U. Operating Valves shall be accessible for operation from floors or platforms where feasible, and handwheels shall not be more than 4'-6" above the floor or platform. In other cases, valves and cocks shall be equipped with chain operated handwheels or extension stems, or other suitable means of remote control.
 - 1. Tighten glands and add additional gland packing as required before final inspection.
- V. Provide sufficient clearance for insulated piping and fittings to permit application of insulation without cutting either pipe line covering or fitting coverings.

3.2 PIPE PROTECTION:

- A. Do not run piping in outside wall, or where freezing may occur. Piping in attic spaces shall be run on the interior side of building insulation.
- B. No water piping in building shall be in contact with earth.
- C. All piping as installed shall be plugged or capped until equipment has been permanently connected.

3.3 GRADE AND DRAINAGE:

- A. All piping shall be erected to insure proper draining. Grade soil, waste, and drainage lines not less than 1/4" per foot unless noted otherwise on drawings. Grade rain water lines minimum 1/8" per foot.

- B. Heating water, chilled water, condenser water and domestic hot and cold water lines shall be graded so as to drain system with as few drains as possible. Drains shall be located in convenient and accessible places. All drainage piping shall extend to floor drains.

3.4 CROSS CONNECTIONS:

- A. No plumbing fixture, device or piping shall be installed which will provide a cross-connection or interconnection between a distributing water supply for drinking or domestic purposes and polluted source.
- B. Provide all hose bibbs and equipped with a hose connection with a vacuum breaker.

3.5 FLEXIBLE CONNECTIONS:

- A. Shall be provided wherever pipe connects to motor operated equipment.

3.6 DIELECTRIC FITTINGS:

- A. Shall be used to connect dissimilar metals (such as steel and copper) to prevent electrolytic action.

3.7 PIPE JOINTING:

- A. All steel pipe shall be joined by flanged, or screwed connections or by welding. Where welding is employed, welding type fittings with beveled ends shall be used. The mitering of pipes to form elbows and the notching of straight runs to form tees will not be allowed. All galvanized pipe shall be screwed. Copper pipe shall be soldered. All piping shall be cut to length by hack-saw or pipe cutter. Cutting of pipe with a torch will not be allowed.
- B. Threaded Piping:
 - 1. Threading shall be American-Standard taper pipe threads. Ream pipe ends and remove burrs after threading. Limit number of threads so that not more than two (2) threads will show beyond fitting.
 - 2. All pipe joints shall be properly sealed with thread coatings applied to the male thread. Sealer for culinary water piping shall be Teflon tape. Sealer for steel pipe in heating, waste and vent lines shall be powdered graphite and Linseed oil or plumage and linseed oil or "Type-Unyte", or Teflon tape.
- C. Soldered Piping:
 - 1. Tubing shall be cut square and burrs removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Joints for sweated fittings shall be made with a non-corrosive paste flux and solid wire solder. Use 95-5 or 96-4 Tin-Antimony solder. Cored solder will not be permitted.
- D. Welding:
 - 1. Welders shall be certified-

- a. Welders shall be certified and shall bear evidence of certification within 30 days prior to commencing work on this project.
 - b. If there is any doubt as to the proficiency of the welder, the Owner may require the welder to take another test. This shall be done at no additional expense to the Owner.
 - c. Welders shall be certified in accordance with section IX of the ASME Boiler and Pressure Vessel Code by Pittsburgh Testing Laboratories or other Testing Agency acceptable to the Owner.
2. Piping 2" and larger, and gas piping over 5 psi except plastic underground piping shall be welded. Welding shall be done using either gas or electric welding equipment. No electric welding shall be done when the atmospheric temperature is below 40 degrees F. without first preheating the ends of the pipe. Thoroughly clean all piping surfaces before welding. The width of circumferential welds shall be 2-1/2 times the wall thickness of the pipe. Piping shall be securely aligned and spaced. The deposited metal shall form a gradual increase in thickness from the outside surface to the center of the weld. Make welds in at least two beads. Each shall be cleaned using stiff wire brushes or pointed descaling tools. The final beads shall be similarly cleaned for inspection.
3. Fittings -
 - a. All fittings shall be ASA Standard fittings and shall be of standard pipe thickness.
 - b. All elbows shall be long radius.
 - c. Wherever tee connections are made to piping systems on the main run, welding sockets shall be installed for the branch connections up to one half the size of the main run, welding tees shall be used.
 - d. The use of fittings formed from welded pipe sections and or notching of pipe will not be permitted. Changes in pipe size shall be made with tapered fittings.
 - e. Connection to equipment shall be flanged using std 150 psi weld neck flanges or flanges rated for pressure of system encountered. Gaskets shall be non-asbestos type of material suitable for temperature, pressure and substance in system.
 - f. All welding fittings used in welding system shall be manufactured by Tube Turns Inc., Taylor Forge and Pipe Works, Midwest Piping and Supply Co., or Bonney Forge and Tool Works, for "Weld-O-Lot" or Thread-O-Lot", or approved equal fittings and shall match the pipe in which they are installed.
4. Safety precautions -
 - a. The contractor shall provide a fire proof mat or blanket to protect the structure, and adequate fire protection at all locations where welding is done.
5. Testing and acceptance -
 - a. Engineer and Owners Representative shall at their discretion shall inspect welds. If welds are found to be suspect, contractor shall provide testing of questionable welds at contractor's expense.
 - b. Testing shall be by radiograph, ultrasonic, sectioning or a combination of these methods at the option of the Owner.

- c. The contractor shall test a minimum of 6 welds up to a maximum of 1/4 of all welds on project as selected by Engineer.
- d. Tests shall be preformed by a recognized independent testing agency acceptable to all parties. Agency shall submit a test report.
- e. If defective joints are discovered Owner shall have right to require all welds removed and redone or remaining welds tested and all defective welds replaced. All work to test, remove and replace welds shall be at contractor's expense.

3.8 PIPE CLEANING AND DISINFECTION:

- A. All piping shall be flushed clean before connection to equipment. Domestic water lines shall be thoroughly flushed out with an alkaline detergent solution to remove pipe dope, oil, loose mill scale, and other extraneous materials.
- B. After the water system has been flushed clean, the shutoff valve to the water main shall be closed. All fixture outlets shall be opened slightly. A solution of sodium hypochlorite and clean water shall be introduced at the new tie-in to the existing water pipes downstream of new valve, until residual chlorine is detected at all water faucets, outlets, etc. The solution shall consist of 1 gallon of 5 percent sodium hypochlorite (Chlorox or Purex) to 200 gallons of water. The solution shall be flushed and all aerators and strainers shall be removed, cleaned and replaced. Care shall be taken to not allow solution to enter existing piping.
- C. Contractor shall furnish to Owner and Architect a written report certifying completion that pipe cleaning and disinfection has been completed and accepted.

3.9 PIPE TESTING:

- A. Test all piping prior to painting, insulating, backfilling or other concealment. Valve off or isolate controls, fittings, equipment or other piping which may be damaged by testing pressures. Provide relief valves set to avoid bursting pressure during test.
- B. Soil, waste, rainwater and vent systems shall be filled to roof level with water and show no leaks over a 24 hour period.
- C. Domestic water, chilled water supply and return, and heating hot water supply and return piping shall be hydrostatically tested at 100 psi with less than a four percent drop in pressure over a six hour period.
- D. Natural gas piping see Section 15192.

END OF SECTION 15101

SECTION 15182 - HYDRONIC PIPING AND SPECIALTIES

PART 1 - GENERAL

1.1 SCOPE:

- A. Includes -
 - 1. Furnishing and installing the low temperature heating hot water system and specialties.
 - 3. Furnishing and installing the chilled water cooling system and specialties including installing of Thread-o-Lets and Weld-o-Lets, valves etc. supplied by control contractor.
 - 3. Furnishing and installing the cooling water cooling system and specialties.
 - 4. Furnishing and installing the condenser water system and specialties
- B. Related Sections -
 - 1. Sections 15010, 15051, and 15101 apply to this section.
 - 2. Control valves specified in section 15910.

PART 2 - PRODUCTS

2.1 PIPE ALL SYSTEMS:

- A. Black steel schedule 40 pipe for supply and return.
 - 1. ASTM-A53
 - 2. ASTM-A106
- B. Fittings
 - 1. Low temperature heating hot water system fittings shall be
 - a. Steel 150 lb rated threaded or welded.
 - b. Flanges standard steel 150 lb.
 - 2. Chilled and cooling water systems fittings shall be:
 - a. Steel 150 lb rated threaded or welded.
 - b. Flanges 150 lb standard steel.
 - 3. Condenser water systems fittings shall be:
 - a. Steel 150 lb threaded or welded
 - b. Flanges 150 lb standard steel.
 - 4. High temperature hot water systems fitting shall be.
 - a. Steel 300 lb welded steel
 - b. Flanges 300 lb steel
 - c. Valves rated for 300 lb

2.2 VALVES

- A. Valves
 - 1. Provide on each valve a name plate showing manufacturer, valve size, grade, and pressure temperature service rating. Valve fluid bore shall match pipe size. All valves shall have renewable seats and discs, large deep stuffing boxes, packing glands and back seat on stem for repacking under pressure. Valves 1-1/2" and smaller shall be screwed or soldered connections. Valves 2" and larger shall be flanged.
- B. Butterfly Valves -

1. Operable in any quadrant, shall operate properly with flow in either direction, and fully suitable for throttling and tight shut-off service.
 2. Pressure drops at valve flows shall not exceed that for Centerline valves.
 3. 150 psi working pressure and -40 to 275 Deg F.
 4. Body - Ductile iron lug-wafer type with lugs tapped on both sides.
 5. Seat - EPT Nordel, rubber lined.
 6. Stem -
 - a. 304 or 316 stainless steel.
 - b. Diameter not to be reduced at bearings.
 7. Disc - Bronze or NDI (nylon coated ductile iron), bubble tight at 150 psig.
 8. Bushings -
 - a. Reinforced teflon, nylon, or olitie.
 - b. Provide bearings at both ends of stems.
 9. Operating Mechanisms - Infinite throttling handle with provision for locking in any position and with position stop.
 10. Approved Manufacturers -
 - a. Bray - Series 30
 - b. Centerline - Series 200
 - c. Crane - 'Monarch' Series
 - d. Milwaukee - ML233E
 - e. Norris/O'Bannon - R Series
 - f. Pratt - Model 2FII
 - g. Watts BF-03
 - h. Hammond
 - i. Nibco Inc
 - j. Kitz
- C. Check Valves
1. Non-Slam Check Valves -
 - a. Silent, spring loaded.
 - b. 125 psi swp
 - c. Silent, semi-steel body.
 - d. Bronze trim and discs.
 - e. Bronze seats with center guide and renewable with reseating with special tools.
 - f. Guided spring.
 - g. Operable in horizontal, vertical, angular, or upside down position.
 - h. Approved Manufacturers -
 - 1) Bell & Gossett ITT or equal by
 - 2) Milwaukee
 - 3) Mueller
 - 4) Nibco Inc.
 - 5) Kitz
- D. Ball Valves
1. Designed for shut off service.
 2. Type 2, Class A rated at 150 lb steam working pressure and 350 deg F maximum temperature.
 3. Two piece bronze body construction with full port, vented ball, screwed end connections, blow-out proof stem, and teflon seats.
 4. Provide extended stem on insulated line.
 5. Approved Manufacturers -

- a. ConBraco - Apollo - 70-100 or equal by
 - b. Hammond
 - c. Milwaukee
 - d. Nibco
 - e. Watts
 - f. Kitz
- E. Balancing Valves
 - 1. Combination balancing valve and flow metering device with provision for connecting differential meter. Each meter connection shall have positive shut-off valves.
 - 2. Valve shall be of non-ferrous construction and globe style design or proportional flow ball valve.
 - 3. Valve shall be capable of being installed either direction in the flow and not affect flow measurement.
 - 4. Unit shall -
 - a. provide precise flow measurement.
 - b. have precision flow balancing.
 - c. have positive shut-off with no-drip seat.
 - 5. Approved Manufacturer -
 - a. Bell and Gossett
 - b. Armstrong CBV
 - c. Flow-set
 - d. HCI

2.3 COCKS:

- A. Gauge Cocks -
 - 1. Brass Tee Handle
 - 2. Approved Manufacturers -
 - a. Ashcroft - 1092
 - b. Ernst - 123
 - c. Trerace - 865
 - d. Walworth - 557

2.4 MANUAL AIR VENT BALL VALVE:

- A. Designed for use as a high point vent.
- B. Rated for 150 lb working pressure water, oil, gas, and steam.
- C. Bronze body with solder end connections, teflon stem & seats, and bubble tight shut-off. 3/8 inch size with tee handle.
- D. Approved Manufacturers -
 - 1. ConBraCo Appollo - 70-200.
 - 2. Hammond - 806
 - 3. Jenkins - 1100T
 - 4. Milwaukee - BA150-TH
 - 5. Nibco S580

2.5 COMBINATION BALL VALVE, HOSE CONNECTION, & CAP:

- A. Approved Manufacturer -

1. ConBraCo - Apollo 78-100

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See Section 15101 for general piping installation procedures.
- B. Install unions or flanges on downstream side of shut-off valves, specialty valves, and inlet and outlet to coils, pumps, and equipment.
- C. Install thermometers on inlet and outlet of coils, pumps, and where shown on the drawings.
- D. Install pressure gauges at pump suction and discharge as close as possible to the connections and where shown on the drawings.
- E. Install balancing valves as shown on the drawings.
- F. TESTING:
 1. Conduct tests in presence of Engineer and before piping is covered.
 2. Tests shall be as described in Section 15101 of the specifications.

END OF SECTION 15182

SECTION 15812 - ROUND STEEL DUCTWORK

PART 1 - GENERAL

1.1 RELATED SECTIONS -

- A. Division 01 General and Sections 15010 and 15051 are part of this Section.

PART 2 - PRODUCTS

2.1 MATERIAL -

- A. Ducts -
1. Fabricate of zinc-coated lockforming quality steel sheets meeting requirements of ASTM A 527-80, "Sheet Steel Zinc Coated (Galvanized) by the Hot-Dip Process, Lock Forming Quality", with Type G coating.
 2. Use of aluminum or non-metal ducts is forbidden.
 3. Duct shall be constructed to SMACNA Pressure Class ½" to 2" standards.
- B. Joints
1. Mechanical type joints shall be sealed with:
 - a. Hardcast
 - b. Design Polymetrics 1010
 - c. Mon-Eco Industries 4452
 2. Welded joints are acceptable.
 3. Joints shall be as recommended in SMACNA HVAC Duct Construction Standards for round duct.
- C. Fittings:
1. Ducts shall be provided with 45 and 90 degree elbows of 2 piece die stamped construction.
- 2.2 Ductwork shall be shop fabricated or spiral ductwork manufactured by a manufacturer regularly engaged in the manufacture of this type of ductwork. Ductwork shall meet all requirements of SMACNA and manufacturer be prior approved.
- 2.3 Standing seam duct may be used in lieu of spiral duct if properly constructed for velocity and pressures encountered.
- 2.4 Duct take-offs and volume dampers. See Section 15821.

PART 3 - EXECUTION

3.1 PERFORMANCE -

- A. Ducts
1. Straight and smooth on inside with joints neatly finished unless otherwise directed.

END OF SECTION 15812

SECTION 15813 - MEDIUM VELOCITY DUCTWORK (PRESSURE CLASS 2" & 3" SEAL CLASS B)

PART 1 - GENERAL

1.1 RELATED SECTION:

- A. Division 01 General and Section 15010 and 15051 are part of this section.

PART 2 - PRODUCTS

- 2.1 Supply air ductwork shown upstream of VAV boxes shall be spiral acoustical duct consisting of an externally pressure-tight metal sheet, a layer of fire resistant fiber glass insulation, an internal liner next to the air flow and a perforated galvanized steel liner. All fittings shall have solid, perforated steel liners. All other round above grade supply and return air ductwork as described in Section 15812 shall be wrapped with insulation.
- 2.2 Equal to United Sheet Metal Acoustic K-27.
- 2.3 Manufacturers shall be those regularly engaged in the manufacturers of this product. Approved manufacturers, United Sheet Metal, Dee's, Metco, or prior approved equal.
- 2.4 As an alternative standing seam ductwork may be used in lieu of spiral duct as long as it is constructed for velocity and pressures encountered.
- 2.5 Joint Sealer
 - A. Mon-Eco 44-52
 - B. Prior Approved Equal

PART 3 - EXECUTION

- 3.1 Duct installation and sealing shall be in strict accordance with SMACNA HVAC duct construction standards and HVAC air duct leakage test manual.

END OF SECTION 15813

SECTION 15816 - STEEL DUCTWORK

PART 1 - GENERAL

1.1 SCOPE -

- A. Includes -
 - 1. Furnish and install the ½" to 2" wg ductwork and related items specified below and shown on the Drawings.
 - 2. Ductwork shall be installed in strict accordance with SMACNA Standards (latest edition) for exterior installation.
- B. Related Work Specified Elsewhere -
 - 1. General Division 01 and Section 15010 and 15051 are a part of this Section.

PART 2 - PRODUCTS

2.1 DUCT MATERIAL -

- A. Fabricate of zinc-coated lockforming quality steel sheets meeting requirements of ASTM A 527-80 with Type G coating.
- B. Use of aluminum or non-metal ducts is forbidden.

PART 3 - EXECUTION

3.1 DUCTS -

- A. Straight and smooth on inside with joints neatly finished unless otherwise directed.
- B. Duct panels through 48 inch dimension having acoustic duct liner need not be crossbroken or beaded.
- C. Brace and install ducts so they shall be free of vibration under all conditions of operation.
- D. Make duct take-offs to branches, registers, grilles, and diffusers as detailed on drawings.
- E. Ducts shall be large enough to accommodate inside acoustic duct liner.
- F. Install internal ends of slip joints in direction of flow. Make joints air tight using mastic type duct sealer.
- G. Cover horizontal and longitudinal joints on all ducts with two layers of hardcast tape installed with hardcast HC-20 adhesive according to manufacturer's recommendations, or equivalent by Duro Dyne Corporation or H.B. Fuller Company.

3.2 Install flexible inlet and outlet duct connections to terminal units, fan coils, air handlers and exhaust fans.

3.3 Provide each duct take-off with an adjustable volume damper to balance that branch -

- A. Anchor dampers securely to duct.
- B. Install dampers in main ducts within insulation.

- C. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.

3.4 Install grilles and diffusers.

3.5 AIR TURNS -

- A. Permanently installed, consisting of curved metal blades or vanes arranged to permit air to make abrupt turn without appreciable turbulence, in elbows of supply and above ground return ductwork.
- B. Air turns shall be quiet and free from vibration when system is in operation.

END OF SECTION 15816

SECTION 15818 - FLEXIBLE DUCT

PART 1 - GENERAL

1.1 DESCRIPTION -

- A. Includes But Not Limited To -
 - 1. Supply air branch duct runouts to diffusers where indicated on Drawings.
- B. Related Work Specified Elsewhere -
 - 1. Volume dampers and sheet metal duct specified in Section 15 812.

1.2 RELATED SECTIONS -

- A. Division 01 General and Sections 15010 and 15051 are part of this Section.

PART 2 - PRODUCTS

2.1 MATERIAL -

- A. Ducts -
 - 1. Formable, flexible, circular duct which shall retain its cross-section shape, rigidity, and shall not restrict air flow after bending.
 - 2. Nominal 1-1/2 inches thick, 3/4 lb/cu ft density fiberglass insulation with air-tight, see-through polyester core, sheathed in seamless vapor barrier jacket factory-installed over flexible assembly.
 - 3. Each individual component in assembly, including insulation, ductwork and vapor barrier, shall meet Class I requirement of NFPA 90A and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.
 - 4. Approved Manufacturers -
 - a. Flexmaster
 - b. Thermaflex
 - c. Wiremold

PART 3 - EXECUTION

3.1 INSTALLATION -

- A. Install duct in fully extended condition free of sags and kinks, using 3'-0" maximum lengths.

END OF SECTION 15818

SECTION 15819 - DUCTWORK TESTING

PART 1 - GENERAL

1.1 RELATED SECTIONS -

- A. Division 01 General and Sections 15010 and 15051 are part of this Section.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.1 PROCEDURE

- A. All ductwork shall be tested prior to concealing or other work which may prevent repair of ductwork. Refer to "Inspection Notice", Section 15051.
- B. Duct testing shall consist of pressurizing the duct system either with the main blower or in sections using a portable blower. Each portion of ductwork to be tested shall be sealed at all openings. The ductwork shall be subjected to an internal pressure not less than 2" W.G or 1-1/2 times working pressure whichever is larger. All ductwork shall be surveyed for audible leaks, and structural stability. Leaks shall be sealed, weak joints repaired, vibrations eliminated. A log shall be kept by the contractor indicating date, conditions, repairs made, and name of individual(s) performing the test. A copy of the log shall be retained for possible observation at the request of the Owner or architect. Ductwork shall maintain test pressure with not more than 10% variation over the period of the test.

END OF SECTION 15819

SECTION 15820 - DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To
 - 1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
- B. Related Sections
 - 1. Section 15051 - General Mechanical Requirements
 - 2. Section 15920 - Temperature control dampers actuators and actuator linkages

1.2 REFERENCES

- A. American Society for Testing and Materials
 - 1. ASTM A 653-96, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'
 - 2. ASTM C 665-96, 'Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing'
 - 3. ASTM C 1071-91, 'Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material)'

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Flexible Equipment Connections
 - 1. 30 oz closely woven UL approved glass fabric, double coated with neoprene.
 - 2. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of 200 deg F.
 - 3. Approved Manufacturers -
 - a. Cain - N-100
 - b. Duro Dyne - MFN
 - c. Elgen - ZLN
 - d. Ventfabrics - Ventglas
- B. Duct Access Doors
 - 1. Factory built insulated access door with hinges and sash locks. Construction shall be galvanized sheet metal, 24 ga minimum.
 - 2. Fire and smoke damper access doors shall have a minimum clear opening 12 inches square or as shown on Drawings to easily service fire damper.
 - 3. Approved Manufacturers -
 - a. AirBalance - Fire/Seal FSA 100
 - b. Cesco-Advanced Air - HAD-10
 - c. Elgen - Model 85 A

- d. Flexmaster - Spin Door
 - e. Hercules
 - f. Kees Inc - ADH-D
 - g. Pottorff - 60-HAD
 - h. Ruskin - ADH-24
 - i. Safe-Air - SAH
- C. Dampers & Damper Accessories
 - 1. Concealed Ceiling Damper Regulators -
 - a. Approved Manufacturers -
 - 1) Cain
 - 2) Duro Dyne
 - 3) Metco Inc
 - 4) Vent-Lock - 666
 - 5) Young - 301
 - 2. Volume Dampers -
 - a. Factory-manufactured 16 gauge galvanized steel, single blade and opposed blade type with 3/8 inch axles and end bearings. Blade width 8 inches maximum. Blades shall have 1/8 inch clearance all around.
 - 1) Damper shall operate within acoustical duct liner.
 - 2) Provide channel spacer equal to thickness of duct liner.
 - b. Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, furnish with concealed ceiling damper regulator and cover plate.
 - c. Approved Manufacturers -
 - 1) American Warming
 - 2) Arrow
 - 3) Cesco
 - 4) Daniel
 - 5) Greenheck
 - 6) Pottorff
 - 7) Ruskin
 - 8) UTEMP
 - 9) Safe-Air
 - 10) Air-Rite
- D. Air Turns
 - 1. Single thickness vanes with one inch trailing edge. Double thickness vanes not acceptable.
 - 2. 4-1/2 inch wide vane rail. Junior vane rail not acceptable.
- E. Branch Tap for Round and Flexible Ductwork (High efficiency type)
 - 1. Factory-manufactured rectangular-to-round or round-to-round 45 degree leading tap fabricated of 24 ga zinc-coated lockforming quality steel sheets meeting requirements of ASTM A 653, with G-90 coating.
 - 2. One inch wide mounting flange with die formed corner clips, pre-punched mounting holes, and adhesive coated gasket.
 - 3. Manual Volume Damper -
 - a. Single blade, 22 ga minimum
 - b. 3/8 inch minimum square rod with brass damper bearings at each end.

- c. Heavy duty locking quadrant on 1-1/2 inch high stand-off mounting bracket attached to side of round duct.
- 4. Approved Models & Manufacturers – Approved Products
 - a. HETD-L by Daniel Manufacturing, Ogden, UT (801) 622-5924
 - b. STO by Flexmaster USA Inc, Houston, TX (713) 462-7694
 - c. HET by Sheet Metal Connectors Inc, Minneapolis, MN (612) 572-1100
 - d. Hercules
 - e. Air-Rite
 - f. Prior approved equal
- f. Duct Sealer For Interior Ducts
 - 1. Approved Products Approved Manufacturers and products-
 - a. Duct Butter or Butter Tak by Cain Manufacturing Co Inc, Pelham, AL (800) 554-0342 or (205) 663-2200 <http://www.cainmfg.com> or (714) 432-0600
 - c. S2 by Duro Dyne, Farmingdale, NY (800) 899-3876 or (516) 249-9000
 - d. Versa Grip 102 by Hardcast Inc, Wylie, TX (800) 527-7092 or (972) 442-6545
 - e. 15-325 by Kingco, King Adhesive Corp, St Louis, MO (800) 233-8171 or (314) 772-9953
 - f. 44-41 by Mon-Eco Industries Inc, East Brunswick, NJ (800) 899-6326 or (908) 257-7942
 - g. Airseal #11 by Polymer Adhesive Sealant Systems Inc, Irving, TX (888) 721-7325
 - h. Multipurpose Duct Sealant by Trans-Continental Equipment Co,
 - i. Water Base Duct Sealer by United McGill Corp, Columbus, OH (800) 624-5535 or (614) 836-9981

2.1 FABRICATION

- A. Air Turns
 - 1. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
 - 2. Quiet and free from vibration when system is in operation.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install flexible inlet and outlet duct connections to each vav box, fan coil unit, and air handling unit.
- B. Access Doors In Ducts
 - 1. Install at each manual outside air damper and at each motorized damper. Locate doors within 6 inches of installed dampers.
 - 2. Install within 6 inches of fire dampers and in Mechanical Room if possible.
- C. Dampers & Damper Accessories
 - 1. Install concealed ceiling damper regulators.
 - a. Paint cover plates to match ceiling tile.

- b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
- 2. Provide each take-off with an adjustable volume damper to balance that branch.
 - a. Anchor dampers securely to duct.
 - b. Install dampers in main ducts within insulation.
 - c. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
 - d. Where concealed ceiling damper regulators are installed, provide cover plate.

END OF SECTION 15820

SECTION 15822 - ACOUSTICAL DUCT LINER

PART 1 - GENERAL

1.1 SCOPE -

- A. Includes -
 - 1. Acoustical lining of all rectangular supply and return air ductwork -
- B. Insulation materials, adhesives, coatings, and other accessories shall have surface burning characteristics as determined by ASTM E 84 not to exceed 25 for flame spread and 50 for smoke developed. Flame proofing treatments subject to deterioration due to the effect of moisture or high humidity are not acceptable.

- 1.2** Duct dimensions shown on drawings are for inside of duct liner and does not include liner insulation.

1.3 RELATED SECTIONS -

- A. Division 01 General and Sections 15010 and 15051 are part of this Section.

PART 2 - PRODUCTS

2.1 DUCT LINER -

- A. One inch thick, 1-1/2 lb density fiberglass.
- B. Approved Manufacturers -
 - 1. CSG Ultralite OR Tough guard
 - 2. Johns-Manville Lina-Coustic
 - 3. OCF Aeroflex
 - 4. Knauf Type M

2.2 ADHESIVE -

- A. Approved water base products- Approved Products
 - 1. Cain - Hydrotak
 - 2. Design Polymeric - DP2501 or DP2502 (CMCL-2501)
 - 3. Duro Dyne - WSA
 - 4. Hardcast - IA-901
 - 5. Kingco - 10-568
 - 6. Miracle - PF-101
 - 7. Mon-Eco - 22-67
 - 8. Polymer Adhesive - Glasstack #35
 - 9. Techno Adhesive - 133
 - 10. United McGill - Uni-tack

2.3 MECHANICAL FASTENERS -

- A. Conform to Mechanical Fastener Standard MF-19/1.
- B. Pins that attach to ductwork with adhesives are not allowed.

- C. Approved Manufacturers -
 - 1. Duro Dyne
 - 2. Omark dished head "Insul-Pins"
 - 3. Grip nails may be used if each nail is installed by "Grip Nail Air Hammer" or by "Automatic Fastener Equipment" in accordance with Manufacturer's recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install mat finish surface on air stream side. Secure insulation to cleaned sheet metal duct with a continuous 100% coat of adhesive and with mechanical fasteners spaced as shown on drawings. Pin all duct liner.
- B. Accurately cut liner and thoroughly coat exposed edges of duct liner, including diffuser drop cut-outs with adhesive to seal fibers. Butt joints tightly. Top and bottom sections of insulation shall overlap sides.
- C. Keep duct liner clean and free from dust. At completion of project, vacuum duct liner if it is dirty or dusty.
- D. If insulation is installed without horizontal, longitudinal, and end joints butted together and properly treated, installation will be rejected and work removed and replaced with work that conforms to this specification. See drawings for detail of joint treatment.

END OF SECTION 15822

SECTION 15823 ROUND DUCT LINER

PART 1 GENERAL

1.1 SUMMARY -

- A. Includes but not limited to -
 - 1. Furnish and install above-grade round ductwork acoustic liner and related items as described in Contract Documents.
- B. Related Section -
 - 1. 15000 and 15050 - General Requirements

PART 2 PRODUCTS

2.1 MATERIALS -

- A. Preformed fiberglass liner 1" thick with black acrylic polymer airstream side coating.
- B. R-Value shall not be less than 4.3.
- C. Coating shall contain EPA Registered Anti-Microbial Agent.
- D. Shall meet the requirements of -
 - 1. UL 181, no detectable fiber loss
 - 2. ASTM G-21 and G-22, show no microbial growth.
 - 3. NFPA 9A and 9B and UL 723 for combustibility and surface burning characteristics.
 - 4. ASTM D5116-90 emissions of volatile organic compounds.

2.2 APPROVED MANUFACTURERS -

- A. Schuller Permacote Spiracoustic preformed round liner and super seal coating, repair and edge seal materials.
- B. Prior Approved Equal.

- 2.3** In lieu of this duct liner, Contractor may install medium velocity, spiral, accousitcal, double walled ductwork equal to United Sheet Metal K-27 Duct.

PART 3 EXECUTION

3.1 INSTALLATION -

- A. Shop install in duct sections according to manufacturer's instructions.
- B. Inspect each duct section after installation of liner and after installation of duct for voids or gaps, tears, or abrasions in liner air side coating and thorough coating of liner edges. Repair using manufacturer supplied products all items found.
- C. If any section of duct is found to be installed without liner edge being thoroughly treated or that the duct liner sections are not tightly butted together and voids filled, installation shall be rejected and the Contractor shall be required to remove ductwork and replace with acceptable materials.

END OF SECTION 15823

SECTION 15841 - PRESSURE INDEPENDENT VAV BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Variable volume terminal units
- B. Integral heating coils.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Box linkage, actuators, controllers etc that interface with the ATC contractor shall be furnished and installed under section 15910.

1.3 RELATED SECTIONS

- A. Section 15950 - Building Automation and Control Systems
- B. Division 16 - Equipment Wiring Systems: Electrical supply to units.

1.4 REFERENCES

- A. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- B. UL 181 - Factory-Made Air Ducts and Connectors.
- C. ARI 880 - Air-Conditioning and Refrigeration Institute Standard Rating Conditions for Air Terminals
- D. ASTM A 527 (Steel Sheet, Zinc Coated Galvanized)
- E. NFPA 90A, Lining

1.5 SUBMITTALS

- A. Submit shop drawings and product data sheets indicating configuration, general assembly, and materials used in fabrication.
- B. Submit product data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate air flow, static pressure, and radiated sound power levels (2nd through 7th octave bands) at design maximum operating conditions. Also submit Radiated Sound NC values ARI 885-90.
- C. Submit manufacturer's installation instructions.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data provide to mechanical contractor for inclusion in O & M Manual see Section 15010.
- B. Include manufacturer's descriptive literature, operating instructions, maintenance and repair data.
- C. Include directions for resetting all pneumatic and electronic controls.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum ten years experience.

1.8 WARRANTY

- A. Provide one year manufacturer's parts warranty from date of acceptance of system.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. VAV Terminal Units
 - 1. General
 - a) VAV terminal units shall be pressure independent with electric controls.
 - b) Unit casings shall be a minimum of 20 gauge galvanized steel for units up to 8", 18 gauge for unit sizes 12" and 16 gauge for units over 12".
 - c) Units shall have round inlets with round or square outlets as shown on drawings and shall have a 2" inlet duct collar for field connection.
 - d) Damper blade shall be of elliptical shape and operate on a 45° arc. Blade shall be a minimum of 16 gauge galvanized with heavy duty extruded neoprene gasket to seal off air leakage not to exceed 2% of the terminal rated CFM at 3" of inlet static pressure. Blade shaft shall pivot on corrosion free oil lite bearings. 90° rotation, single blade dampers are not acceptable.
 - e) Entire terminal unit shall be factory assembled with electric controls. Metal assemble shall be mechanically sealed and fastened.
 - f) Flow measuring taps and flow chart shall be furnished with each unit for ease of field setting or changing of air flows. All controls shall be easily accessible for field adjustments without having to remove any of the terminal casing or any access panels.
 - g) Sound data shall be compiled from testing in an ADC independent certified laboratory and in accordance with ARI standard 880.
 - 2. Controls
 - a) Manufacturer shall factory mount DDC controls supplied by the controls contractor.
 - b) The unit shall have a Differential pressure airflow sensor which traverses the duct using the equal cross sectional area or log-linear traverse method along two perpendicular diameters located across the inlet. The sensor will provide a differential pressure signal amplified to equal 3 times the velocity pressure with an accuracy of at least $\pm 10\%$ throughout the range of 350 to 2600 fpm inlet duct velocity.
 - 3. Accessories
 - a) Hot water heating coil:

- 1) Coil shall be mounted in a minimum 20 gage galvanized steel casing with slip and drive discharge connections, and factory mounted on the base unit as shown on the equipment drawings, Coils shall have:
 - 2) Aluminum fins bonded to the copper tubes by mechanical expansion.
 - 3) Number of coil rows and circuits shall be selected to provide performances as required by the plans.
 - 4) Up to 4 rows as shown on equipment drawings or designed on the equipment schedule. Right or left-hand fittings with sweat connection sizes as indicated on equipment drawings.
4. Approved Manufacturers
 - a) Price
 - b) Titus
 - c) Carnes
 - d) Nailor
 - e) Krueger
 - f) Metal-Aire

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.2 ADJUSTING

- A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design air flow to 25 percent nominal air flow Set units with heating coils for minimum 30 percent full flow.

END OF SECTION 15841

SECTION 15851- DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To
 - 1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents
 - 2. Quality of grilles installed in metal doors
- B. Related Sections
 - 1. Section 15051 - General Mechanical Requirements

1.2 MAINTENANCE

- A. Extra Materials - Leave tool for removing core of each different type of grille for building custodian.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

- A. T-Bar Slot Diffusers
 - 1. Finish – anodized aluminum
 - 2. Approved Manufacturers
 - a. Price TBD 2 or equal by
 - b. Carnes
 - c. J & J
 - d. Krueger
 - e. Metal air
 - f. Titus
 - g. Tuttle & Bailey
 - h. Nailor
 - i. Air Control Products
 - j. Environmental Air

PART 3 EXECUTION

3.1 INSTALLATION

- A. Anchor securely into openings. Secure frames to ductwork by using four sheet metal screws, one per side. Level floor registers and anchor securely into floor.

END OF SECTION 15851

SECTION 15910 – AUTOMATIC TEMPERATURE CONTROLS SYSTEM

1.1 GENERAL CONDITIONS:

- A. All pertinent sections of this specification may be part of the work described in this section. This contractor will require coordination of other trades. This contractor will have a project manager, with not less than five years experience, on site when ATC work commences to coordinate daily work activities.

1.2 MANUFACTURER'S QUALIFICATIONS:

- A. Firms regularly engaged in the manufacture of electric control equipment of types and sizes required, whose products have been in satisfactory use in similar service for not less than 10 years in the State of Utah. The manufacturer shall be represented locally by an authorized distributor or reseller that has been properly trained and certified by the manufacturer to represent their products. The manufacturer shall have had local representation or their products in the State of Utah for a consistent period of not less than 10 years.
- B. Approved Manufacturers:
 - 1. Tour Andover Controls (TAC) by Utah Controls
 - 2. Staefa Controls by Atkinson
- C. Pursuant to the requirements of the State of Utah the successful contractor, Utah Controls or Atkinson, will be required to complete the security requirements. To work in Court facilities the company and each employee must complete the required securing measures prior to working on site. All costs associated with this process including applications, BCI background checks and facilitation to meet this requirement shall be inclusive to this project. It is the responsibility of the successful contractor, Utah Controls or Atkinson, to complete these requirements and maintain these requirements throughout project duration.

1.3 CONTRACTOR QUALIFICATIONS:

- A. Qualified Bidders: As an extension to the existing State of Utah regional control system, the Automatic Temperature Control (ATC) system shall be installed and certified by Utah Controls utilizing TAC Controls (Vista or INET) or by Atkinson Electronics utilizing Staefa Controls (Talon). No other manufacturers or contractors will be considered. The installation of the DDC system must be approved and certified by a factory representative of the controls manufacturer.
- B. Past Projects: The BAS contractor shall have completed a minimum of 20 projects within the last five years which are at least equal in dollar value and scope to this project. The past projects shall have utilized the same control system manufacturer that is being proposed for this project. A list of similar projects, dollar amount, scope, contact names and numbers shall be provided by the BAS contractor if requested by the owner.
- C. Longevity: The BAS contractor shall have a minimum of 10 years experience (as an authorized factory support center for the controls manufacturer) installing and

servicing consistent computerized building automation control systems. Employee experience may not be substituted for company experience.

- D. The BAS contractor shall have complete engineering, service and installation departments. The contractor shall have an established 24 hour emergency service organization. The required extended service submission by the BAS contractor will include service response times and advanced replacement policies for bid consideration.
- E. Personnel, Coverage and Response Capabilities: The BAS contractor shall have service and support employees within 30 miles of the project location. The service and support employees shall be full time employees of the BAS contractor and available. The BAS contractor's main office, training center, warehouse and repair center shall be in the State of Utah, within 30 miles of the project location. The contractor shall have a complete warehouse and repair facility with components to support this installation. Documentation and review of such capabilities and facilities may be required for review if requested by the owner's representative.

1.4 SCOPE OF WORK:

- A. The scope of work shall include all labor, material, and equipment necessary to replace the existing Staefa control system.
- B. Install a new Direct Digital Control (DDC) for the Provo County 4th Judicial Courts as identified including software, hardware, programming, valves, damper actuators, sensors, and all like items, setup, start-up and owner instruction as well as all pertinent required items to insure a fully functioning DDC automation system.
- C. The existing Staefa Control system including all controllers, sensors, valves, damper actuators and like items and shall be removed by the controls contractor and returned to the owner.
- D. Provide a complete start up and commissioning report including air systems and water balancing, adjusting and calibration. Balancing shall be done by an independent firm specializing in this work.
- E. This system shall include, but not are limited to, controls and equipment as hereinafter specified:

- Air Handlers
- VAV Boxes
- Boiler System
- Hot Water Pumps
- Chiller and Chilled Water System
- Chilled Water Pumps
- Cabinet Unit Heaters
- Exhaust Fans
- Domestic Water System

1.5 WORK TO BE PERFORMED BY OTHERS

- A. The Contractor shall carefully review all notes, coordination schedules, and drawings for work required under this section of the specification.
- B. Division 16 shall furnish and install all single phase and multiple phase electrical power wiring to magnetic starters, disconnect switches, and motor. Division 16 shall also provide 120v power to each ATC panel as shown on the plans. ATC contractor shall be responsible for step down transformers and 24 VAC wiring to ATC equipment.
- C. The sheet metal contractor shall install all dampers supplied by the ATC contractor. Each damper shall be installed so that it will operate freely and without binding. Each damper shall be checked and those not properly installed shall be replaced or reinstalled without cost to the ATC contractor.
- D. The test and balance contractor shall perform a complete air systems and water balance and provide the owner with a certified compliance report. Balancing data sheets shall indicate the required and actual CFM of all supply, return and exhaust outlets or inlets, and be totaled and summarized by systems. Hydronic balancing data sheets shall list required temperature or pressure differentials used for balancing coils, radiations, condensers, etc. Sheets shall show in comparison final as balanced versus design values. The ATC contractor shall allow up to 80 hours to assist the test and balance contractor with the commissioning of this project.

1.6 RELATED WORK:

- A. Mechanical Contractor to install all control valves and temperature sensor wells. The ATC contractor to provide ATC valves and temperature sensors wells.

1.7 ELECTRICAL WIRING:

- A. A licensed electrical contractor shall install all ATC conduit and wiring. The ATC Contractor shall be responsible for the complete ATC installation. All wiring shall be installed in accordance to the National Electrical Code and local codes. The ATC contractor shall hold a valid electrical license for the State of Utah.
- B. All ATC wiring shall be installed in ¾" **conduit** (minimum) and in accordance with the National Electrical Code.

1.8 MAINTAIN SYSTEM OPERATION

- A. This project will take place in an occupied and operating building. During the entire period of construction the mechanical system must remain in operation as not to disrupt the facilities occupants. Work located in occupied areas must be done after hours as not to disrupt the work of the buildings tenants. Local shut downs for the installation of VAV and other system controls are expected but shall be coordinated with other trades and per the construction schedule.
- B. The existing Staefa DDC control system shall remain in operation until the new system has been installed and is functional.

1.9 SUBMITTALS:

- A. Prior to any installation, the Contractor shall submit, with 15 days after award of contract, a complete submittal package. This submittal shall contain six (6) copies of complete literature on all control equipment including control diagrams as per the sequence of operation.

1.10 SEASONAL ADJUSTMENTS:

- A. Seasonal adjustments to the control system will need to be included in this bid. Depending on the finish date this contractor will schedule 8 hours, with maintenance personal to check the system in the mode of either winter conditions or summer.

1.11 PROJECT MANAGEMENT:

- A. Provide a designated project manager who will be responsible for the following:
 - 1. Construct and maintain project schedule
 - 2. On-site coordination with all applicable trades and subcontractors
 - 3. Attend project meetings
 - 4. Make necessary field decisions

1.12 WARRANTY:

- A. Provide all services, materials and equipment necessary for a one-year period after beneficial use has been established.

1.13 TRAINING:

- A. Training will consist of a factory authorized training course totaling not less than 24 hours. Classes will be held in a classroom setting with an instructor that is accredited and certified by the manufacturer. A total of up to 4 employees from the State of Utah DFCM shall be permitted attend the training course. All travel costs and course tuition shall be the sole responsibility of the ATC Contractor.
- B. In addition to the above, on site specific training shall consist of 4 hours on site and will be at the owner's time desecration. Owner to provide one week notice of when they would like this sessions.

PART 2 - PRODUCTS AND EQUIPMENT:

2.1 MANUFACTURERS:

- A. Provide new TAC or Staefa Controls Direct Digital Controls (DDC) as described herein. This DDC system shall be compatible with and tied into the existing State of Utah DFCM network via the existing DDC control system.

2.2 HOST COMPUTERS:

- A. Provide the following host computer:
- B. Building host computer shall have as a minimum the following:
 - IBM compatible Pentium IV 2.4 GHZ
 - 512 MB DDR RAM memory
 - 40 GB hard drive
 - One 1.4 meg, 3-1/2" floppy drive
 - One 52X CD rom
 - Two USB Ports
 - Three button mouse w/mouse pad
 - 17" flat screen monitor
 - Operating system (Microsoft Windows XP Professional)
- C. The ATC contractor to provide a fully operational DDC control system that may be monitored, controlled & modified from the Centralized Host computer shall construct the controlling software database. All control schedules, algorithms, and control logic shall be in place within each DDC controller and stored as back-up copies on the Host computers hard disk which may be down-loaded to individual DDC controllers as necessary. Documentation provided shall include block software flowchart showing the interconnection between each of the control algorithms and sequences.
- D. The building shall be represented by complete graphical floor plans, with accurate locations of each major piece of HVAC equipment. A zoom feature shall allow the operator to select any of the main fan systems, and see a graphical representation of the system with dynamic representation of all appropriate DDC input & output devices. Each major piece of HVAC equipment shall be graphically represented at the Host computer with all appropriate DDC points dynamically represented.

2.3 VALVES:

- A. Replace all existing ATC control valves with new. Valves to be manufactured by Belimo or Honeywell and shall utilize electronic 4-20mA, 0-10VDC, or PWM positioning and electric actuation. ATC valve bodies 2" and smaller shall be screw type; larger valves shall be flanged. Screwed valves shall be rated at 150 psi or greater and shall have cast iron or brass bodies. Flanged valves shall be rated at 250 psi or greater and have cast iron or steel bodies. All automatic valves shall be for DDC control application. All valves shall be disc/plug and seat or ball construction. Valves to be sized for a 3-lb. pressure drop.

2.4 DAMPERS AND ACCUATORS:

- A. All existing damper actuators shall be replaced with new. The ATC contractor shall furnish motorized control dampers that are not supplied with the air handling units. All dampers shall be factory-built, low leakage units such as Ruskin CD-50 or approved equal. Blades shall be 6" maximum width; material to be extruded

aluminum, and blade linkage to be external and accessible. Frames shall be 5" x 1" and made of extruded aluminum hat channel, 0.125" minimum thickness with corner braces to assure that they are square. Dampers shall be low leakage type with compressible end seals and neoprene of extruded vinyl blade and jamb seals. Leakage shall be not exceed 6.2 cfm/sq. ft. at 4" W.G. Dampers shall require less than 7#-in/sq. ft. torque at the operating shaft.

2.5 BUILDING MANAGEMENT SYSTEM (BMS):

- A. The building management system shall permit full operator communication and control, including obtaining information about performance of this system; changing times and parameters; adding or deleting points; changing relationships between sensors and controlled equipment; creating or modifying control strategies; and diagnosing system malfunctions. English language prompting format shall be used. The operator will be presented with options at the CRT in English. Features of the system will be compatibility to run on Windows NT. System to have TCP/IP protocol communication; support for net plus routers; open database support; integrated graphic editor; asynchronous auto-dial/auto answer, and one way dialing. This Contractor shall provide all software required for efficient operation of all the automatic system functions required by this specification. Software shall be modular in design for flexibility in expansion or revision of the system. It is the intent of this specification to require provisions of a system, which can be fully utilized by individuals with no, or limited, previous exposure to PC's and programming techniques and languages. If the system to be provided requires the use of any modified BASIC, "C", PASCAL, or DRUM Language program, or writing "line" programming statements to modify operation or strategy in the system, the vendor shall provide unlimited, no charge, software modification and support for a period of five (5) years after the completion of the project in addition to the warranty period specified elsewhere. Systems, which are factory programmed, are unacceptable. Direct Digital Control (DDC) Modules: Each DCU shall provide "Block" or "Modular" programming software so that the operator can easily develop custom control strategies and sequences of operation, without learning a programming language.
- B. Control loops and sequences shall be defined using "modules" that are analogous to traditional pneumatic or electric control devices. Modules may be linked together to form more complex control strategies. The use of mathematical equations, "BASIC", or proprietary programming languages for defining a DDC control loop is unacceptable.

2.6 LOCAL AREA NETWORKS (LAN):

- A. Controller LAN: The FMS shall provide communication between the DCU's over a Local Area Network (LAN).
- B. The Controller LAN shall be a "bus type" network over which information is transmitted in a "token passing" fashion between all the nodes on the network.

- C. The Controller LAN shall have the capacity to contain not less than 64 nodes as a minimum. Each work station, DCU, or "gateway" device shall represent a node to the network.
- D. The Controller LAN shall connect the nodes in a fully distributed environment, each DCU operating autonomously while communicating with all other nodes on the network. Controller LANs requiring a communication controller (for any reason) will not be acceptable. LAN lengths in excess of 24,000 ft. shall be supported.
- E. A break in the communication path of the Controller LAN shall be announced as an alarm and shall automatically initiate a Controller LAN reconfiguration such that the resulting sections of the Controller LAN continue to function as separate LANs. No loss of control shall result from such a break in the Controller LAN.
- F. Commercial LAN: Workstations on the Controller LAN may also reside on a higher tier "commercial" LAN. This "commercial" LAN shall be based on Ethernet, and comply with IEEE 802.3 standards. Where a "commercial" LAN is implemented, it shall be possible to connect multiple Controller LANs together, with global data sharing across this commercial LAN.
- G. Data speed shall not be less than 10 Megabaud.
- H. An operator at a workstation on the "commercial" LAN may connect to any other workstation on the "commercial" LAN as if the operator were sitting at the other workstation.
- I. Alarms and special event notices shall be routed to different workstations on the "commercial" LAN based on time of day, and day of the week.
- J. Operator password assignment shall be available on both a system-wide basis and a workstation by workstation basis.

2.7 DIRECT DIGITAL CONTROL SYSTEM-OVERVIEW:

- A. The direct digital control system shall consist of local microprocessor-based digital control panels (DCP) network together for information sharing and operating convenience and a central operator interface station.
- B. It is the intent of these specifications to create a combined direct digital control system. All system type control functions, such as those used for fan systems, boilers, chillers, central plant and pumps, building pressure, etc., shall be accomplished by using software algorithms in the respective DCP.
- C. Each major mechanical component (fan system, chiller, boiler, etc.) shall have its own dedicated DCP so that failure of any will not result in catastrophic system failure. DCP's utilizing a master-slave relationship shall have a master unit provided for each major mechanical system.

- D. All safety devices such as fire alarm shutdown, smoke detectors, low limit thermostats, etc., shall be hard wired to accomplish their critical functions completely independent of the DCP and shall have additional outputs as required to sever as inputs to the DCP for secondary control and reporting functions.

2.8 CONTROLLER (DCU):

- A. The controller shall be a microprocessor and shall form the basic control unit of the system. It shall operate as a stand-alone unit providing all the necessary algorithms and software logic to perform the local HVAC control sequences and energy saving functions. Failure of any one DCU shall have no effect on the other DCU's in the system. Programming shall be block type and accomplished by the operator's terminal, or the remote operator terminal. The DCU shall have the ability for direct digital control; automatic time scheduling; demand limiting; calculated points universal inputs with configurable outputs; an RS-485 Lan port; an RS-232 port; an TTL port for hand held console; trend sampling, and on line editing capability. The controller shall operate independent of any central computer, shall have built in diagnostic routines.
- B. Inter-computer communications shall support true global token passing control strategies as well as allow data status and values connected to one DCU to be used within application programs of another DCU.
- C. The system shall provide a network communication facility to support global calculation and control strategies to be continuously implemented in the distributed system. The system shall provide for events detected in any area of the total network to initiate commands to any other device within the network. The system shall also provide for connected or calculated data to be continuously shared between any or all controllers within the total network. Through the DCU's may share none critical sensor information, at no point within the facility shall quick reacting and constantly changing point information be communicated via the network bus. These types of point shall be hardwired to the DCU in which the algorithm exists.

2.9 SOFTWARE:

- A. This contractor shall provide the most current versions of all programming, controlling, monitoring software & graphic/system displays required by the DDC system. These shall include but not be limited to DDC operating system and data files. **All software, programs and intellectual rights to the database shall become the property of the owner.**
- B. Copies of all software releases available within one year of the substantial completion shall be provided and installed to the owner at no cost.

2.10 ROUTER and SECURITY OF CONTROL SYSTEM:

- A. Provide and install an Ethernet router at this site to provide constant on-line monitoring by the facility personnel. This device shall serve as the network

interface between the ATC control/controllers at the remote site and the existing Wide Area Network (WAN). This router to tie directly to the control system. The router shall support the following protocol, Telnet via TCP, SNMP via UDP, and ATC contractor's proprietary protocol via UDP. The router shall require a Static IP address, Subnet Mask and Gateway provided by the network administrator. The maximum allowable transmission/response packet sizes shall not exceed 186 bytes, and acknowledge/response packet sizes shall not exceed 64 bytes. UDP packets shall be proprietary to the control system with critical packets using a private key encryption for security.

2.11 FREEZE PROTECTION THERMOSTAT:

- A. Freezestats shall have 20'sensing element with any foot capable of actuating contacts on a temperature drop below 35 deg F. Freezestats shall have manual reset and 4 wire double circuit block. Additional freezestats shall be installed on coils over 40-sq. ft. in size. Activation of the low limit thermostat shall stop the air handling unit, close the outside air damper, open the heating valve and start the heating booster pump.

2.12 AIR DUCT SMOKE DETECTORS:

- A. Smoke detectors shall be furnished and wired by Division 16. All smoke detectors shall be interlocked with the building fire alarm system by the electrical contractor.

2.13 TEMPERATURE SENSORS:

- A. Provide thermistor or thin film silicon sensors for all temperature applications, except differential chilled water for BTU calculation, where precision matched Platinum RTDs shall be used. Solid state sensors shall be linear, drift free, and require only a one-time calibration. A look-up table in the connected controller shall linearize thermistors or similar non-linear temperature devices. Resolution shall be better than .5 degrees F for Micro Controller applications, and better than .2 degrees F for DCP applications.
- B. Space sensors shall have an integral port for connection of a portable "intelligent" sensor to communicate with its DCP. This port and portable "intelligent" sensor may be used for initiating the "test mode" locally to verify all DCP control sequences, and perform test and balancing functions. To eliminate the downtime associated with rechargeable batteries, the portable "intelligent" sensor shall receive its power from the sensor port.

PART 3 – EXECUTION

3.1 SEQUENCE OF CONTROL:

A. Boiler B-1, B-2 and Hot Water Pumps P-5, P-6

1. Boilers B-1 and B-2 shall operate in a lead lag sequence. Boiler B-1 shall be the lead boiler, and boiler B-2 shall be the lag boiler. The boiler (B-1),

(B-2) and hot water pumps are energized via the BAS, Building Automation System. When the outside air temperature falls below 70°, the boiler (B-1), (B-2) and water pump (P-5) are started. When the outside air temperature is below 35°, pump (P-6) is started. When the outside air temperature increases the reverse will occur. The boilers are reset via the BAS to accommodate an adjustable reset schedule by modulating the gas valve.

B. Penthouse Unit

1. The VAV fan system consists of SF-1 and SF-2 driven by a VFD, a heating coil, a cooling coil, filters & outdoor air, return air and relief air dampers. Exhaust fans will be controlled by the DDC system to control building static pressure.
2. The supply fan shall be started from a local DDC controller through a "HAND-OFF-AUTO" switch, located on the face of the VFD panel.
3. In the "HAND" position, the supply fan shall operate continuously; in "OFF" position, fan shall be stopped, and in "AUTO" position, fan shall be on during OCCUPIED mode and cycled to maintain minimum space temperature when in the UNOCCUPIED mode as controlled by the DDC system. The system shall be occupied by a user adjustable time schedule. The time schedule shall permit different start and stop times for each day of the week.
4. Fan system operation in AUTO mode shall be subject to freezestat, building fire alarm, supply duct high static pressure, building optimal start-stop programs, and other conditions or logic programmed into the DDC controllers.
5. If the fan system is shut-down, or fails to start due to abnormal conditions, an alarm shall be generated within the DDC system. When the fan is stopped under any condition, the outside air damper and relief air dampers shall close.
6. A manual reset, high limit pressure switch sensing supply duct static pressure within the fan room shall shut down the fan and alarm the DDC system if its 3" w.c. (adjustable) setting is exceeded.
7. OCCUPIED mode: A supply air temperature sensor and an outdoor air temperature sensor, acting through DDC controllers, shall modulate the heating coil valve, outdoor air and return air dampers, direct evaporative cooling sump pump, and cooling coil to maintain supply air temperature according to the following schedule:

<u>OUTSIDE AIR TEMP:</u>	<u>SUPPLY AIR TEMP:</u>
55°F	55°F
10°F	65°F

8. Whenever heating valve is not closed or when outside air temperature exceeds 76° F, the outside air damper shall close to the minimum position as determined by the return duct air quality transmitter and minimum ventilation requirements.

9. A 0-5" w.c. Supply duct static pressure transmitter with its static tip located 2/3 of the way down the supply duct and acting through a DDC controller shall modulate supply fan speed to maintain 1.2" w.c. (adjustable) supply duct static pressure.
10. An air quality transmitter located in the return air duct, acting through a DDC controller, shall reset the outside air damper minimum position. The amount of reset action shall be adjustable and subject to a maximum of 25% minimum outside air.
11. A mixed air temperature sensor, acting through a DDC controller, shall provide 48°F mixed air temperature low limit control of the air handling system. If mixed air temperature drops below 39°F, supply and relief fans shall stop, outdoor and relief air dampers shall close and an alarm shall be generated by the DDC system and indication at the Host Computers. The new damper actuator shall be spring return. The damper shall fail to the closed position, closed to the outside air.
12. Outdoor air dampers shall remain closed when return air temperature is below 68°F.
13. UNOCCUPIED/Night Setback mode:

Night Low Limit: When the BAS schedule is in the unoccupied mode, and any room temperature falls below the unoccupied low limit setpoint, 60 Deg F., (adjustable) the supply fan unit shall be commanded on and shall continue to run until the room temperature rises by 5 Deg F (adjustable). A space temperature sensor, acting through a DDC controller, shall cycle the supply fan with all heating valves open 100% until each unit individually reaches the desired minimum space temperature setpoint 68 Deg F., (adjustable).
14. Outdoor air & relief dampers shall remain closed. The HVAC chillers will not be enabled during unoccupied hours. The AHU chilled water valve shall close to the coil when the supply fan is not running.

C. Cooling Systems

1. The air handling system shall have 3 stages of cooling. Proper building pressure control shall be verified and demonstrated throughout all 3 stages of air handler cooling.
 - a. 1st stage/Economizer mode: When the outdoor air temperature is below 55 Deg F. (adjustable), the BAS shall modulate the mixed air dampers to maintain a discharge air temperature of 55 Deg F. (adjustable). The BAS shall use an averaging sensor in the mixed air plenum to maintain a minimum of 48 Deg F. (adjustable) mixed air temperature.
 - b. 2nd stage/Evaporative Cooling: When the outdoor air temperature is above 55 Deg F, the BAS shall modulate the mixed air dampers to

- use 100% outside air, and cycle the direct evaporative cooling sump pump to maintain discharge air temperature.
- c. 3rd stage/Chilled Water: When the direct evaporative cooling cannot maintain the discharge air temperature, the chiller shall be enabled, the evaporative cooling sump pump shall stop, and the outside air damper shall open to minimum outside air position based on CO2 control. The chilled water and condenser water pumps start anytime there is a call for chiller operation. Provide a new 3-way chilled water control valve. The chilled water control valve shall modulate to maintain discharge air temperature of 55 Deg F. (adjustable). The chiller is interlocked with flow switches in addition to auxiliary contacts on the starters of the chiller water and condenser water pumps, to prevent operation if flow is not sensed. A PI control loop sensing condenser water supply temp will sequence the cooling tower CT-1 high and low speeds and modulate the cooling tower bypass valve to maintain an 80° (adj.) setpoint.
- 2. Ambient Lockout
 - a. A low ambient lockout will prevent operation of the chiller and chilled water pumps below 50° outside air temperature.

D. Exhaust Fans EF-1-4, 5,7

- 1. Exhaust fans EF-1-4, 5,7 are started anytime the building is in the occupied mode.

E. Emergency Chiller Shut Down and Ventilation

- 1. An emergency push button located outside the mechanical room door where shown on the prints shall stop all mechanical equipment in the chiller room and start RF-5 for Ventilation.

F. Sequence of Operation for Building Relief

- 1. A PI control loop sensing building pressure will modulate the dampers to the relief fans and start relief fans RF-1/ RF-4 to satisfy the space static pressure setpoint of .04 inches water column (adj.). In conjunction with the modulating dampers the RF fans shall be automatically staged on and off by the DDC system based on building pressure. Start/Stop and status indication (proof of flow or current) shall be provided for each individual fan. The staging sequence of the fans shall be configured to permit equal run times. Each month a different RF and associated modulating damper will lead as the 1st relief fan. i.e. January. RF-1 1st, RF-2 2nd, RF-3 3rd, RF-4 4th. February = RF-2 1st, RF-3 2nd, RF-4 3rd, RF-1 4th. The DDC system will stage the next RF in the event of a call for a RF start/stop when no proof of operation is detected. An alarm will be generated at the host computer.

G. Cabinet Unit Heaters and Unit Heater A

1. A thermostat will open the hot water valve and start the fan when the space temperature is below the heating setpoint. The fan is subject to a strap on aquastat set at 110°, (located on the return water piping).

H. VAV Box

1. The Occupied/ Unoccupied Mode of each VAV box will be individually programmed at the BAS for individual occupied/ unoccupied schedules. The occupied/ unoccupied modes will be determined by the BAS or the occupant override push button for the judge's chambers, court rooms, and jury rooms only. If the push button over-ride is selected for any one of these rooms, the three other corresponding zones shall be placed in occupied mode as well. All other zones shall have the ability to customize schedules through the BAS. The judge's chambers, courtrooms, and jury rooms shall also have the ability for the occupants to adjust space temperature setpoint by $\pm 2^\circ$ (adj.). All other zones shall not have user adjustment. If the space temperature is equal to or greater than the cooling temperature setpoint, the box controller shall modulate the box damper using the PI algorithm. The PI algorithm is also used to maintain the space temperature cooling setpoint. The VAV box controller shall calculate the required air quantities subject to preprogrammed maximum and minimum velocity settings. On a fall in space temperature lower than the cooling temperature setpoint, the box shall control the minimum velocity ventilation settings. On a continued fall in temperature equal to the heating temperature setpoint, the box controller shall modulate the coil valve to satisfy the space temperature heating setpoint. Each individual VAV box controller shall accept a heating CFM value for baseline control. This heating CFM set point shall be adjustable by the operators. The reverse shall occur on the rise in space temperature greater than its heating temperature setpoint.
2. An air quality sensor will sense organic vapors in the return air stream and will be used to reset the minimum volume of the supply air at the VAV box up on sensing concentration levels above setpoint.
3. In the morning warmup mode as selected by the BAS, the VAV box will control the maximum velocity setting with the heating valve under control of the heating temperature setpoint of 72° (adj.).

I. Domestic Water Recirculation Pump CP-1

1. A strap on aquastat will cycle the pump CP-1 to maintain temperature.

J. Outdoor Air Pre-heat Unit MU-1

1. The make-up air unit MU-1 shall be used to temper outdoor air when OSA temperature is less than 40° (adj.). Provide new two stage gas valve for the two existing gas burner sections. Gas valves shall be staged on to maintain minimum mixed air temperature per supply air re-set schedule. If make-up air unit discharge temperature drops below 35° (adj.), an alarm

shall be sent through BAS to software interface. MU-1 shall shut down, and outside air dampers shall close until reset. The new damper actuator(s) shall be spring return. The damper shall fail to the closed position, closed to the outside air.

END OF SECTION 15910

SECTION 15960 - AIR SYSTEM TEST AND BALANCE

PART 1 - GENERAL

1.1 SCOPE:

- A. Includes -
 - 1. Testing, balancing and adjusting of the following systems:
 - a. Supply and Return Air
 - b. Exhaust Air
 - c. Relief Air
 - 2. Test Report bound in Operating and Maintenance Manuals.
 - 3. Contractor shall make changes in pulleys, belts, motors and dampers or add dampers as required for correct balance as recommended by Air Balance & Testing Agency at no additional cost to Owner.

1.2 RELATED SECTIONS:

- A. Division 01 General and Sections 15010 and 15051 are part of this Section.

1.3 AGENCY:

- A. Contractor shall procure services of an independent Air Balance & Testing Agency which specializes in balancing and testing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.
- B. Agency shall provide proof of having successfully completed at least five projects of similar size and scope and be a certified AABC or NEBB agency. Work by this Agency shall be done under direct supervision of a qualified registered professional heating and ventilating engineer employed by Agency. Agency shall maintain an office within 75 miles of project.
- C. Instruments used by Agency shall be accurately calibrated and maintained in good working order.
- D. If requested, conduct tests in presence of Engineer.
- E. Agency shall be approved in writing by the Engineer. Neither Engineer or anyone performing other work on this Project under Division 15 shall be permitted to do this work.
- F. Contractor shall award test and balance contract to the approved agency upon receipt of his contract to proceed to allow Agency to schedule this work in cooperation with other Sections involved and comply with completion date.
- G. Balancing agency shall be represented at final inspection meeting by qualified testing personnel with balancing equipment and two copies of the Air Balancing Test Report.
- H. Engineer will choose and direct spot balancing of one zone. Differences between the spot balance and test report will be justification for requiring repeat of testing and balancing for entire project.
- I. Rebalancing shall be done in presence of Engineer and subject to his approval.
- J. Spot balance and rebalance shall be performed at no additional cost to Owner.
- K. Approved Balancing Agencies
 - 1. Bonneville Test and Balance

2. BTC Services
3. Certified Test and Balance
4. Danis Test and Balance
5. Intermountain Test and Balance
6. RS Analysis
7. Technical Specialties

PART 3 - EXECUTION

3.1 PREPARATION

- A. Begin air balance and testing upon completion of the mechanical installation of air conditioning, ventilation, heating, exhaust systems, and controls including installation of all specialties and devices.

3.2 PROCEDURES:

- A. Before any adjustments are made, the system is to be checked for items such as dirty filters, filter leakage, major duct sections, zones, etc.
- B. Contractor shall place exhaust and ventilating systems and equipment into full operation and continue their operation during each working day of testing and balancing.
- C. Air Balance & Testing Agency shall perform tests specified, compile test data, and submit four copies of complete test data to Contractor for forwarding to Engineer for evaluation and approval.
 1. Approved copies of report shall be bound in Operations & Maintenance Manuals. See Division 15010 General.
- D. Systems shall be completely balanced and all reports submitted to Engineer prior to test run and final inspection.
- E. System performance shall be checked when outside weather is at or near design conditions, if practicable. Heating and/or cooling thermometers or sensors shall be placed in the areas served by each fan system. Temperature readings shall be taken at half hour intervals, and further adjustments or corrections made as required to obtain uniform temperatures. All occupied spaces shall be checked for drafts and noises caused by the make-up and exhaust systems, and any unsatisfactory conditions corrected.
- F. Balancing shall be performed during normal project working hours when project construction foreman is present on the job site to provide access and see his mechanical sub contractor is available to operate system and make necessary corrections.

3.3 STANDARDS:

- A. Balance shall be preformed in complete accordance with the following standards as applicable to the agency certification:
 1. HVAC Systems Testing, Adjusting, and Balancing, SMACNA 1983.
 2. Testing, Balancing, and Adjusting of Environmental Systems, SMACNA 1974.
 3. Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems, NEBB 1983.

4. AABC National Standards, Fourth Edition 1982.
 5. Procedural Standard for Measuring Sound and Vibration, NEBB 1977.
- B. Balancing Agency's National Certification shall warrant the system balance and performance. A copy of guarantee certificate shall be included in each test and balance report.

3.4 TESTING PROCEDURE:

- A. Air Balance & Testing Agency shall perform following tests and balance system in accordance with following requirements:
- B. Test and adjust blower rpm to design requirements.
- C. Test and record motor full load amperes.
- D. Make Pitot Tube tranverse of main supply and obtain design cfm.
- E. Test and record system static pressures, suction, and discharge.
- F. Test and adjust system for design cfm air.
- G. Test and adjust system for design cfm outside air.
- H. Test and record entering air temperatures (db heating and cooling).
- I. Test and record entering air temperatures (wb cooling).
- J. Test and record leaving air temperatures (db heating and cooling).
- K. Test and record leaving air temperatures (wb cooling).
- L. Adjust main supply and return air ducts to proper design cfm, + or - 5%.
- M. Adjust zones to proper design cfm, supply and return, + or - 5%.
- N. Test and adjust each diffuser and grille to design requirements. Individual air outlets, when one of three or more are serving one space, may have a tolerance of 10% from the average.
- O. Identify each diffuser and grille as to location and area served.
- P. Identify and list size, type, and Manufacturer of diffusers, grilles and testing equipment. Use Manufacturer's rating on equipment to make required calculations.
- Q. In readings and tests of diffusers and grilles include required cfm and fpm velocity & test cfm and fpm after adjustments.
- R. In cooperation with Section 15 900, set adjustments of automatically operated dampers to operate as specified, indicated, or noted.
- S. Adjust diffusers and grilles to minimize drafts.

3.5 EXHAUST AIR SYSTEMS:

- A. Systems are to be adjusted to same tolerance as supply systems. Each space is to be checked to see that it is positive, neutral or negative as indicated by quantities of supply and exhaust air shown on contract documents. Any discrepancies shall be investigated and corrected, and the proper pressure relationship established.
- B. Building pressure shall be checked at outside doors, relief air damper adjusted as required to leave building neutral or under slight positive pressure.

3.6 REPORT

- A. Report shall include:
 1. Record test data on AABC standard forms or facsimile thereof.

2. A set of black and white or blue line prints with all air openings marked to correspond with data sheets and with temperature clearly marked.
3. Show on final report the percent of design CFM to the actual CFM of each diffuser represents.
4. The certified report shall include for each air handling system the data listed below:
 - a. Equipment
 - 1) Installation data
 - a) Manufacturer and model
 - b) Size
 - c) Arrangement, discharge, and class
 - d) Motor hp, voltage, phase, cycles, and full load amps
 - e) Location and local identification data
 - 2) Design data
 - a) Data listed in schedules on drawings and specifications.
 - 3) Fan recorded (test) data
 - a) cfm
 - b) Static Pressure
 - c) rpm
 - d) Motor operating amps
 - e) Motor operating bhp
 - b. Duct systems
 - 1) Duct air quantities (maximum and minimum) - main, submains, branches, outdoor (outside) air, total air, and exhaust.
 - a) Duct size(s)
 - b) Number of Pitot tube (pressure) measurements.
 - c) Sum of velocity measurements (Note: Do not add pressure measurements)
 - d) Average velocity
 - e) Recorded (test) cfm
 - f) Design cfm
 - 2) Individual air terminals
 - a) VAV box number and maximum and minimum settings.
 - b) Terminal identification (supply or exhaust, location and number designation)
 - c) Type size, manufacturer and catalog identification
 - d) Applicable factor for application, velocity, area, etc., and designated area
 - e) Design and recorded velocities - fpm
 - f) Design and recorded quantities - cfm
 - g) % of design recorded quantity- cfm represents

END OF SECTION 15960

SECTION 15970 - WATER SYSTEM TEST AND BALANCE

PART 1 GENERAL

1.1 SUMMARY

- A. Provide hot water, chilled water and condenser water system testing & balancing.

1.2 SUBMITTALS

- A. Quality Assurance - Agency will submit four copies of complete test data to Architect for evaluation and approval including neatly typed listing of items required by Contract Documents.
- B. Closeout Submittals - Agency will submit approved copies of water test and balance report for inclusion in Operations & Maintenance Manual.

1.3 QUALITY ASSURANCE

- A. Qualifications - Work by Agency will be performed under direct supervision of qualified Heating and Ventilating Engineer employed by Agency.

1.4 SEQUENCING

- A. Test and balance subcontract will be awarded to Agency upon contractors receipt of Notice To Proceed to allow Agency to schedule this work in cooperation with work of other Sections involved and to comply with completion date.
- B. Schedule testing & balancing to begin upon completion of cooling and heating systems including installation of all specialties and devices. Begin work of this Section after heating, ventilating, and cooling systems and equipment are in full operation and continue their operation during each working day of testing and balancing. Agency shall be same as is performing work under section 15994.

PART 2 PRODUCTS -
(Not Used)

PART 3 EXECUTION -

3.1 FIELD QUALITY CONTROL

- A. Site Tests
 - 1. Instruments used by Agency will be accurately calibrated and maintained in good working order.
 - 2. Balance & Testing Agency will provide technicians with following instruments for field use
 - a. One set of pressure gauges and fittings
 - b. Dry bulb thermometer
 - c. Wet bulb thermometer

- d. Thermocouple unit and thermocouples
- e. Set of balancing cock adjustment wrenches
- f. Portable field flowmeter
- 3. If requested, conduct tests in presence of Architect.
- 4. Preparation of System - Phase I
 - a. Open valves to full position including coil stop valves, close bypass valves, and return line balancing cocks.
 - b. Remove and clean strainers.
 - c. Examine water in system to determine if it has been treated and is clean.
 - d. Check pump rotation.
 - e. Check expansion tanks to make sure they are not air bound and system is full of water.
 - f. Check air vents at high points of water systems to make sure they are installed properly and are operating freely. Make certain air is removed from circulating system.
 - g. Set temperature controls so coils are calling for full heating or cooling.
 - h. Check operation of automatic valves.
 - i. Check and set operating temperature of boilers and chiller to design requirements.
 - j. Perform air balance before beginning water balance.
- 5. Performance of Testing & Balancing - Phase II
 - a. Set pumps to proper gpm delivery.
 - b. Adjust flow of hot water through boilers, chilled water through chiller and condensing water thru chiller and cooling tower.
 - c. Check leaving water temperatures, return water temperatures, and pressure drop through boilers and chiller. Reset to correct design temperatures.
 - d. Check water temperature at inlet side of coils. Note rise or drop of temperatures from source.
 - e. Balance each water coil.
 - f. Upon completion of flow readings and coil adjustments, mark settings and record data.
- 6. Performance of Testing & Balancing - Phase III
 - a. After making adjustments to coils, recheck settings at pumps, chiller, cooling tower and boilers. Readjust if required.
 - b. Install pressure gauges on each coil, then read pressure drop through coil at set flow rate on call for full heating and cooling.
 - c. Check and record the following items at each heating element -
 - 1) Inlet water and air temperatures
 - 2) Leaving water and air temperatures
 - 3) Pressure drop of each coil
 - 4) Pressure drop across bypass valve
 - 5) Pump operating suction and discharge pressures and final TDH
 - 6) Mechanical specifications of pumps
 - 7) Rated and actual running amperage of pump motor

END OF SECTION 15970